

REPORT

Environmental and Social Impact Assessment

Nouakchott Container Terminal

Client: Arise Mauritania

Reference: BF3959IBRP1905062219

Status: Final/01

Date: 07 May 2019



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Document title: Environmental and Social Impact Assessment

Document short title: ESIA NCT
Reference: BF3959IBRP1905062219
Status: 01/Final
Date: 07 May 2019
Project name: ESIA Nouakchott Port
Project number: BF3959
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Classification

Project related



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Acronyms

Acronym	Acronym description
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
GHG	Green House Gases
IFC	International Finance Corporation
IMROP	Institut Mauritanien de Recherches Océanographiques et des Pêches
ISPS	International Ship and Port Facility Security
MET	Ministry of Equipment and Transport
NCT	Nouakchott Container Terminal
PANPA	Port Autonome de Nouakchott dit Port de l'Amitié
PS	(IFC) Performance Standards (on Environmental and Social Sustainability)
SEP	Stakeholder Engagement Plan
SNCTPC	Société Nationale Chinoise des Travaux de Ponts et Chaussées
TEU	Twenty-foot equivalent unit (a measure used for capacity in container transportation)

1 Introduction

1.1 Background

Arise Mauritania S.A. (**Arise**), a joint venture company held by Arise Mauritius (parent company of GSEZ) and Meridiam, is planning to construct and operate a new container and hydrocarbon terminal in the Port of Nouakchott, Mauritania (hereafter referred to as '**the Project**' or '**Nouakchott Container Terminal**' or '**NCT**').

Arise contracted the Mauritanian environmental consultancy firm EnviroConseil Mauritanie (**EnviroConseil**) to conduct an Environmental Impact Assessment (EIA) for the Project in line with national requirements (hereafter referred to as '**the National EIA**') for local permitting purposes. The National EIA was conducted between October and December 2018 and approved by the Ministry of Environment in February 2019 (a copy of the approval letter is provided in **Appendix 1**).

Arise contracted **Royal HaskoningDHV** in November 2018 to execute the Environmental and Social Impact Assessment (**ESIA**) for the Project following the IFC Performance Standards on Environmental and Social Sustainability (**IFC PS**).

The present document is the ESIA for, and addresses the environmental and social impacts of, the Project.

1.2 Purpose of the ESIA

The purpose of the ESIA is to identify the potential positive and adverse environmental and socio-economic effects that may arise from the Project, identify the measures to be used to manage, mitigate, and monitor the impact of those effects, and to assess the residual impact following mitigation. Impacts are to be assessed using the environmental and social baseline conditions as a point of departure.

In addition to identifying and assessing impacts, measures required to avoid, prevent, mitigate or compensate significantly adverse impacts and enhance beneficial impacts have also been included as an integral part of the ESIA. Reference is made to plans to monitor, manage and evaluate the implementation of mitigation measures and the Project's performance in terms of environmental and social baseline conditions.

The ESIA serves the following purposes:

- To allow policy makers to appreciate the extent and significance of any potential environmental and social impacts associated with the Project, and take these into consideration while planning the execution of the Project;
- To provide information on the project to the competent authorities in accordance with legally defined procedures; and
- To provide clear instructions to Arise, its (construction) contractors and its Project Management Consultant (PMC) with regard to any measures that need to be implemented in order to limit any potential negative impacts to acceptable levels.

1.3 Report Structure

The report is organised as follows:

Chapter 1: Introduction

This chapter provides background information about the Project and highlights the objectives and scope for the impact assessment study as well as the applicable regulatory framework for the proposed project.

Chapter 2: Project Policy and Regulatory Framework

This chapter provides a description of the applicable regulatory framework for the proposed project

Chapter 3: Project Description

This chapter provides a description of the Project, including location, project components and activities, details of Project inputs and outputs, and alternatives considered.

Chapter 4: Environmental and Social Baseline Conditions

This chapter describes the available baseline data on the environment and social resources and receptors within the project study area.

Chapter 5: Stakeholder Engagement

This chapter outline the results of the stakeholder engagement activities undertaken so far.

Chapter 6: Potential Impacts and Mitigation Measures

In this chapter, potential and associated environmental and social impacts of project activities are identified, assessed and evaluated. For each identified impacts, mitigation and enhancement measures are proposed to be implemented.

Chapter 7: Environmental and Social Management Plan ('ESMP')

This chapter presents the ESMP that will be adopted throughout the project life cycle.

Chapter 8: References

This chapter provides details on the reference material used in the preparation of this ESIA.

As much as possible, materials presented in the report are highlights, covering the most important findings and results. For clarity and to make the report easy reading and friendly, raw data and other details are presented in Appendices which are duly referred to in the main report.

2 Project Policy and Regulatory Framework

2.1 Introduction

As mentioned before, the Mauritanian domestic regulatory route, which must be satisfied to obtain the necessary permits to undertake the construction and operational activities has been performed by EnviroConseil in a separate study. The international investment route to secure international finance by following the IFC Performance Standards on Environmental and Social Sustainability is described below. In addition to meeting the requirements under the Performance Standards, Arise will comply with applicable national laws, including those laws implementing national obligations under international agreements and conventions.

2.2 Mauritanian Legal and Administrative Framework

2.2.1 National Regulatory Framework

Key Mauritanian environmental and social (labour conditions) legislation includes the following:

- Framework Law on the Environment No. 2000-045, adopted in July 2000, aims to establish the general principles that should underpin the national policy on environmental protection and serve as a basis to harmonise ecological imperatives with sustainable economic and social development requirements.
- Decree 2004 - 094 of 04 November 2004 on Impact Assessment, amended and supplemented by Decree 2007 - 105. The decree is issued pursuant to the provisions of the Environmental Code with regard to the implementation of Environmental Impact Assessments (EIA). In Article 2, it defines the EIA as a document to assess, appraise and measure the direct, indirect and cumulative environmental effects of a project in the short, medium and long term.
- Ordinance No. 2007-037 on the planning, protection, management and development of the coastline. Its purpose is to define the rules relating to the planning, protection, management and development of the coastline.
- Law No. 95-009 on the Merchant Marine Code and Decree No. 99-05 on the conditions for the exercise of maritime professions and prerequisites to practice a maritime profession.
- Decree No. 99-146 concerning seafarers - rules relating to work aboard ships (manpower, wages, organisation of work, etc.).
- Decree No. 84-163 B regulating maritime traffic and the Council responsible for its supervision.
- Law 2010-033 of 20 July 2010 on the Code on Crude, which lays down the regulations governing oil and gas exploration.
- Law No. 017-2015 of 29 July 2015 establishing the Marine Fishery Code.
- Decree No. 2010-010 / PM of 28/01/2010 creating security areas at the Nouakchott (and Baie du Lévrier ports in Nouadhibou).
- Decree No. 2004-017 Labour Act – establishing the Labour Code.

The Mauritanian EIA process is depicted in Figure 2-1. As mentioned in the Introduction chapter, the National EIA for the Project was approved by the Ministry of Environment on 5th February 2019. A copy of the approval letter is in **Appendix 1**.

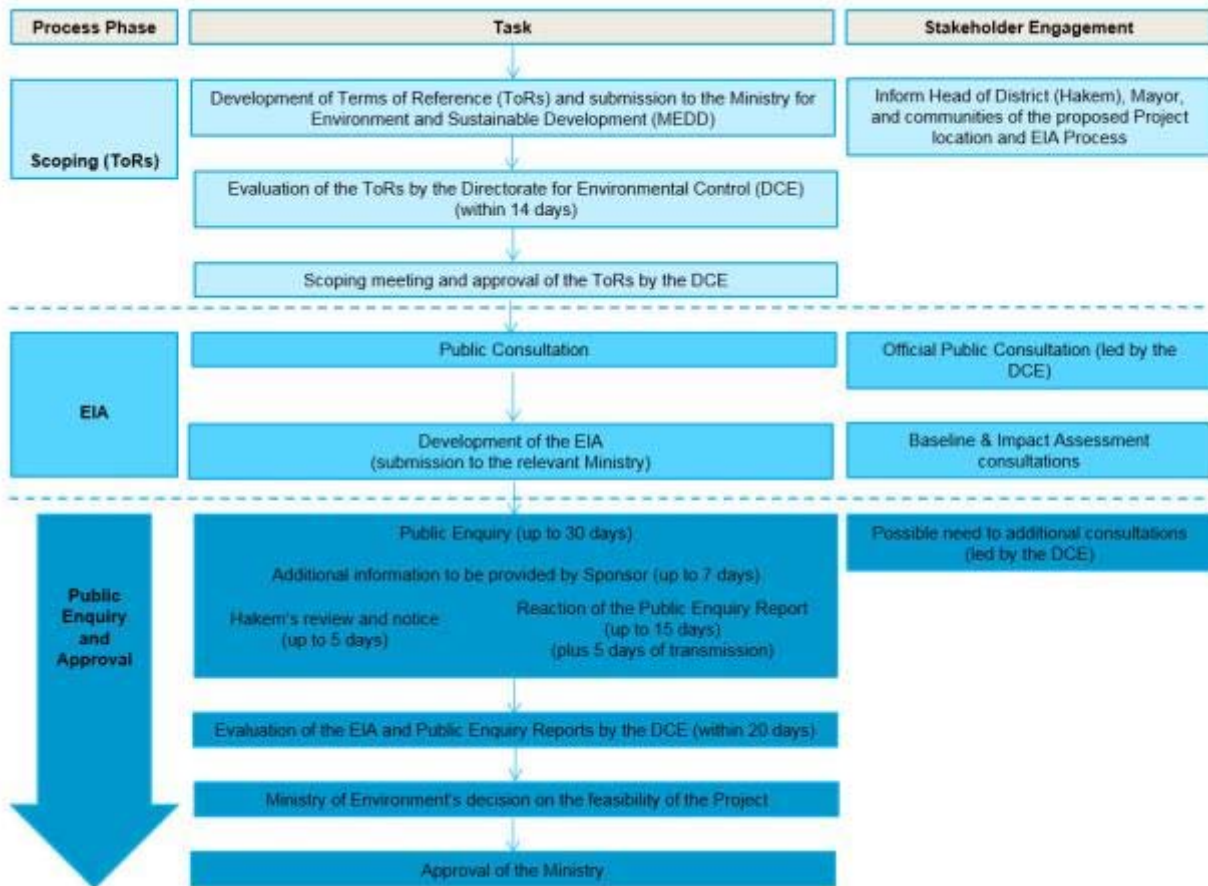


Figure 2-1: Mauritanian ESIA process

2.2.2 Relevant International Environmental Agreements and Conventions

Mauritania is signatory to many international conventions on the environment, including those on climate change and biodiversity, such as:

- **The United Nations Framework Convention on Climate Change (UNFCCC).** The UNFCCC framework sets non-binding limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. Instead, the framework outlines how specific international treaties (called "protocols" or "Agreements") may be negotiated to specify further action towards the objective of the UNFCCC
- **The International Convention for the Prevention of Pollution from Ships, 1973 as amended by the Protocol of 1978 relating thereto (MARPOL 73/78), and its annexes, prepared within the framework of the International Maritime Organization.** MARPOL sets out to eliminate pollution of the sea by oil, chemicals, and other harmful substances that might be discharged in the course of operations; to minimise the amount of oil that could be released accidentally in collisions or stranding's by ships, fixed or floating platforms; to improve further the prevention and control of marine pollution from ships, particularly oil tankers.
- **Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa (Bamako Convention) (1991).** The Bamako

Convention strictly regulates the transboundary movement of hazardous wastes to a from Africa. N.B. Mauritania is only a 'simple signatory'¹ of this Convention.

- **The Convention on Biological Diversity (CBD) (1992)**. The CBD aims to conserve biodiversity, promote sustainable use of its components, and ensure fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.
- **The Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region (Abidjan Convention) (1984)**. The Convention provides an overarching legal framework for all marine-related programmes in West, Central and Southern Africa. Under its articles, the Convention lists the sources of pollution that require control as: ships, dumping, land-based activities, exploration and exploitation of the seabed, and atmospheric pollution. It also identifies environmental management issues from which cooperative efforts are meadows, wetlands, barriers and lagoons
- **The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973)**. The CITES Convention ensures, through international co-operation, that the international trade in species of wild flora and fauna does not threaten the survival in the wild of the species concerned, and to protect endangered species from over-exploitation by means of a system of import-export permits.
- **Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention) (1991)**. The RAMSAR Convention seeks to conserve and promote the wise use of wetlands by national action and international cooperation.
- **The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1979) and incorporating The African-Eurasian Migratory Water Bird Agreement (1995)**. To conserve terrestrial, marine, and avian migratory species and their habitats throughout their range by providing strict protection for endangered migratory species, and by undertaking co-operative research activities.
- **African Charter on Human and Peoples' Rights (Banjul Charter)**. An international human rights instrument that is intended to promote and protect human rights and basic freedoms in the African continent.

All of the eight fundamental **International Labour Organization (ILO) Conventions**, as listed hereunder, are into force in Mauritania,:

- C087 on Freedom of Association and Protection of the Right to Organize
- C098 on the Right to Organize and Collective Bargaining
- C029 on Forced Labor
- C0105 on the Abolition of Forced Labor
- C038 on Minimum Age (of Employment)
- C182 on the Worst Forms of Child Labor
- C100 on Equal Remuneration
- C111 on Discrimination (Employment and Occupation).

Most of the conventions mentioned above do not include direct rules or standards for e.g. dredging work, but they are important in the context of the Project's activities and the work envisaged.

2.3 International Best Practice Standards and Guidelines

The Project and ESIA process will be guided by international best practices, notably:

¹ When a treaty is subject to discretionary ratification after signature, the signature is referred to as a simple signature. It does not commit a State to ratify a treaty, let alone comply with its terms.

- IFC's Performance Standards on Environmental and Social Sustainability (2012) ('the IFC PS's');
- World Bank Group Environmental, Health, and Safety Guidelines ('the EHS Guidelines'), and specifically:
 - General EHS Guidelines (2007); and
 - EHS Guidelines for Ports, Harbours and Terminals (2017); and
 - EHS Guidelines for Shipping (2007).

The complete IFC PS and WB EHS Guidelines can be viewed on the IFC website on the following pages: [IFC Performance Standards](#) and [EHS Guidelines](#).

In cases where the IFC's PS's, guidelines and documents did not address some specific environmental and/or social aspect, other applicable international standards were considered (e.g. those of the World Health Organisation (WHO), International Labour Organisation (ILO) and International Union for Conservation of Nature (IUCN).

Based on the outcomes of the scoping assessment, the Project has been categorized as Category A as per [IFC's Policy on Environmental and Social Sustainability](#) (i.e. project "with potential significant adverse environmental or social impacts that are diverse, irreversible or unprecedented") and therefore requires a full, comprehensive ESIA. Main reasons for this categorization are the potential impacts associated with the substantial dredging activities in the construction phase and the risk of spills and incident at the hydrocarbon terminal in the operation phase.

2.3.1 IFC Performance Standards

The IFC PS's are the benchmark for all international project financing. In addition to the requirements of the IFC PS's themselves, project sponsors must meet the requirements of local and international laws in these areas. In this way, the IFC PS ensure project developers go beyond the minimum compliance with laws and regulations of the countries they operate in, where such laws and regulations fall below the IFC PS's.

Table 2-1, lists the objectives of the eight IFC PS's, and provides notes on their applicability for the Project.

Table 2-1: IFC Performance Standards and their Applicability to the Project

Performance Standard	Applicability	Note
PS 1: Assessment and Management of Environmental and Social Risks and Impacts <ul style="list-style-type: none"> • Identify project E&S risks and impacts • Adopt mitigation hierarchy (anticipate/avoid, minimize, compensate/offset) • Improve performance through an Environmental and Social Management System (ESMS) • Engagement with Affected Communities, other stakeholders 	Yes	Applies to all projects that have environmental and social impacts. Addressed by this ESIA Report including the sections describing the Project's environmental and social management programs
PS 2: Labour and Working Conditions <ul style="list-style-type: none"> • Fair treatment, non-discrimination, equal opportunity • Good worker – management relationship • Comply with national employment and labor laws • Protect workers, in particular vulnerable categories 	Yes	Applies to workers directly engaged by the client (direct workers), workers engaged through third parties (contracted workers), as well as workers engaged by the client's primary suppliers (supply chain workers).

Performance Standard	Applicability	Note
<ul style="list-style-type: none"> Promote safety and health Avoid use of forced labor or child labor 		
PS 3: Resource Efficiency and Pollution Prevention <ul style="list-style-type: none"> Avoid, minimize, and reduce project-related pollution More sustainable use of resources, including energy and water Reduced project-related Greenhouse Gas (GHG) emissions 	Yes	<p>Implementation of the actions necessary to meet the requirements of the PS is managed through the clients ESMS.</p> <p>The project will be designed to operate in compliance with the relevant World Bank EHS Guidelines.</p>
PS 4: Community Health, Safety, and Security <ul style="list-style-type: none"> To anticipate and avoid adverse impacts on the health and safety of the Affected Community To safeguard personnel and property in accordance with relevant human rights principles 	Yes	Affected Community in the Project area of influence is limited to other PANPA workers, fishermen and potentially communities along the main access roads to the Project site.
PS 5: Land Acquisition and Involuntary Resettlement <ul style="list-style-type: none"> Avoid, minimize adverse social and economic impacts from land acquisition or restrictions on land use Improve or restore livelihoods and standards of living Improve living conditions among displaced persons 	No	The Project does not require additional land, as expected land requirements fall within the existing port facility.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources <ul style="list-style-type: none"> Protection and conservation of biodiversity Maintenance of benefits from ecosystem services Promotion of sustainable management of living natural resources 	Yes	The Project's maritime components, in particular the dredging of the navigation channel, is located in modified and natural habitat, some of them with potential significant biodiversity value.
PS 7: Indigenous Peoples <ul style="list-style-type: none"> Ensure full respect for IPs (human rights, dignity, aspirations, livelihoods, culture, knowledge, practices) Avoid, minimize adverse impacts Sustainable and culturally appropriate development benefits and opportunities Free, Prior and Informed Consent (FPIC) in certain circumstances 	No	There are no indigenous people as defined by PS present in the Project's area of influence.
PS 8: Cultural Heritage <ul style="list-style-type: none"> Protection and preservation of cultural heritage Promotion of equitable sharing of cultural heritage benefits 	No	The terrestrial part of the Project is located in an existing port and industrial area. There are no known cultural heritage features within the project footprint.

2.3.2 World Bank EHS Guidelines

The World Bank Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP)². EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

² Defined as the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

2.4 Compatibility of the IFC Performance Standards and Mauritanian Legal and Administrative Framework

The IFC PS represent the opportunity to ensure a bankable ESIA and subsequent third-party investment from sponsors who are part of or signed up to these standards. The IFC PS do not directly conflict with Mauritanian Law; the scope places a special emphasis upon engagement, disclosure and consideration of key issues.

Disclosure and consultation requirements for the Mauritanian EIA are shorter. Disclosure and consultation in accordance with IFC PS should begin early in the ESIA process and should be carried out in an on-going manner as risks and impacts arise. It is deemed necessary to plan and coordinate the two consultation processes to comply with both requirements and not to create an unclear consultation process. The first consultation moment for the National EIA has therefore been combined with the engagement moment in the scoping phase for the international ESIA. The extended consultation requirements of the IFC - 60 days of disclosure of the ESIA Report - will be addressed through a separate consultation period. In order to come to an optimal stakeholder engagement, a Stakeholder Engagement Plan (SEP) has been developed for this specific project approach, as presented in [Appendix 6](#).

2.5 Arise Corporate Policies

The Arise Environmental Sustainability Policy and Arise Health and Safety Policy lists the Company's commitment to managing business activities to risks for environment and communities, and the commitment to providing an healthy and safe workplace. These policies are shown in Figure 2-2 and Figure 2-3.



Environmental Sustainability Policy

ARISE is committed to managing our business to minimize the environmental risks for Air, Water, Land and Biodiversity related to our Business and the communities in a safe environment.

Our goals:

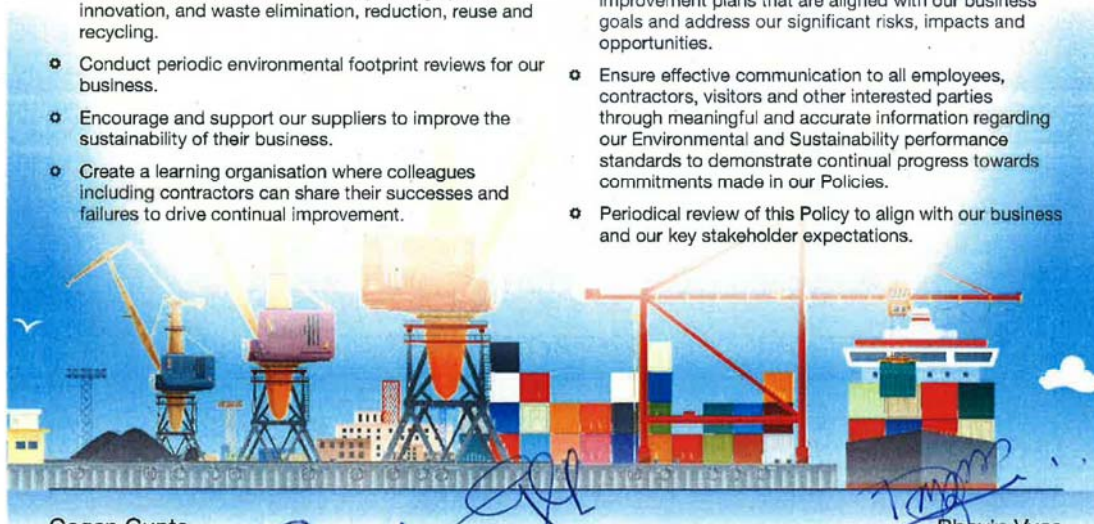
Deliver a world-class Environmentally Friendly and Sustainable Management programme at our Infrastructure Projects, through effective risk management as far as practically possible to minimize the impact on Air, Land and Water.

To achieve these goals, we will:

- Select and manage land responsibly through relevant risks and impacts assessments to our existing and new facilities.
- Increase the efficiency of all resources used including fuel, energy, water and land.
- Reduce any impacts arising from our business activities on the environment and biodiversity through process innovation, and waste elimination, reduction, reuse and recycling.
- Conduct periodic environmental footprint reviews for our business.
- Encourage and support our suppliers to improve the sustainability of their business.
- Create a learning organisation where colleagues including contractors can share their successes and failures to drive continual improvement.

For the management and implementation of this and all policies, we will:

- Conduct our business with integrity and in compliance with the relevant laws of countries where we operate and in accordance with recognised international and national standards, guidelines and processes.
- Ensure all levels of our management accountable for applying the policy in their business decisions.
- Ensure all employees, business partners, contractors, suppliers and visitors understand this Policy and their own responsibilities and accountabilities and receive appropriate training and support for delivering successfully.
- Establish strategies and management systems to create and prioritise SMART objectives and execute improvement plans that are aligned with our business goals and address our significant risks, impacts and opportunities.
- Ensure effective communication to all employees, contractors, visitors and other interested parties through meaningful and accurate information regarding our Environmental and Sustainability performance standards to demonstrate continual progress towards commitments made in our Policies.
- Periodical review of this Policy to align with our business and our key stakeholder expectations.



Gagan Gupta
Président – ARISE

Bhavin Vyas
Directeur E&S ARISE

Version – 01
15-02-2019

Figure 2-2: Arise Corporate Environmental Sustainability Policy



Health and Safety Policy

ARISE is committed to providing a healthy and safe workplace for our employees, contractors and visitors.

Our vision

Having a 'Zero harm culture' that is delivered through safety leadership.

Our Goal:

Deliver a world-class Health & Safety programme at our Infrastructure Projects, through effective workplace risk management as far as practically possible as a core capability.

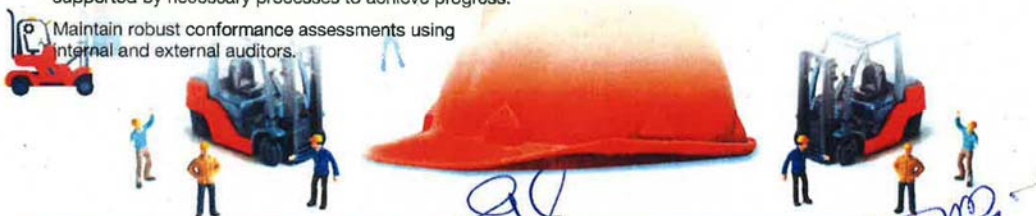
To achieve our Goal, we will:

- Implement a safety management programme based on safe systems of work, including but not limited to Risk Assessment and Mitigation, Standard Operating Procedures, Emergency Response Plan and Permit To work System.
- Encourage and utilize every opportunity to develop consultation between management, employees, contractors and other interested parties on those matters affecting Health and Safety at the workplace.
- Form a Safety committee with Head of the organization as Chairperson and with representation from both Management and Workers to identify, assess and eliminate risk or implement risk mitigation actions based on risk prioritisation at Workplace.
- Establish Specific, Measurable, Achievable, Reliable and Time bound health and safety goals and targets supported by necessary processes to achieve progress.

- Maintain robust conformance assessments using internal and external auditors.

For the management and implementation of all policies, we will:

- Conduct our business with integrity and in compliance with the relevant laws of countries where we operate and in accordance with recognised international and national standards, guidelines and processes.
- Ensure all levels of our management accountable for applying the policy in their business decisions.
- Ensure all employees, business partners, contractors, suppliers and visitors understand this Policy and their own responsibilities and accountabilities and receive appropriate training and support for delivering successfully.
- Establish strategies and management systems to create and prioritise SMART objectives and execute improvement plans that are aligned with our business goals and address our significant risks, impacts and opportunities.
- Ensure Effective Communication to all employees, contractors, visitors and other interested parties through meaningful and accurate information regarding our Health and Safety performances to demonstrate continual progress towards commitments made in our policies.
- Periodical review of this Policy to align with our business and our key stakeholder expectations.



Gagan Gupta
Président – ARISE

Bhavin Vyas
Directeur E&S ARISE

Version – 01
15-02-2019

Figure 2-3: Arise Corporate Health and Safety Policy

3 Project Description

3.1 Project Location

The Project will be located within the boundaries of the existing Port of Nouakchott ('the port' also called in French '**Port Autonome de Nouakchott dit Port de l'Amitié**' or '**PANPA**'), approximately 15km south-west of Nouakchott city.

The port is located in the administrative region (Wilaya) of Nouakchott-Sud, subdivided further to be located in the sub-regional department (Moughataa) of El Mina.

The port is located within a designated economic industrial zone, where several hydrocarbon storage facilities, cement factories, grain and flour factories amongst others are located. Despite being an economic hub for the region/country, no noticeable permanent residential areas are located in the site vicinity.

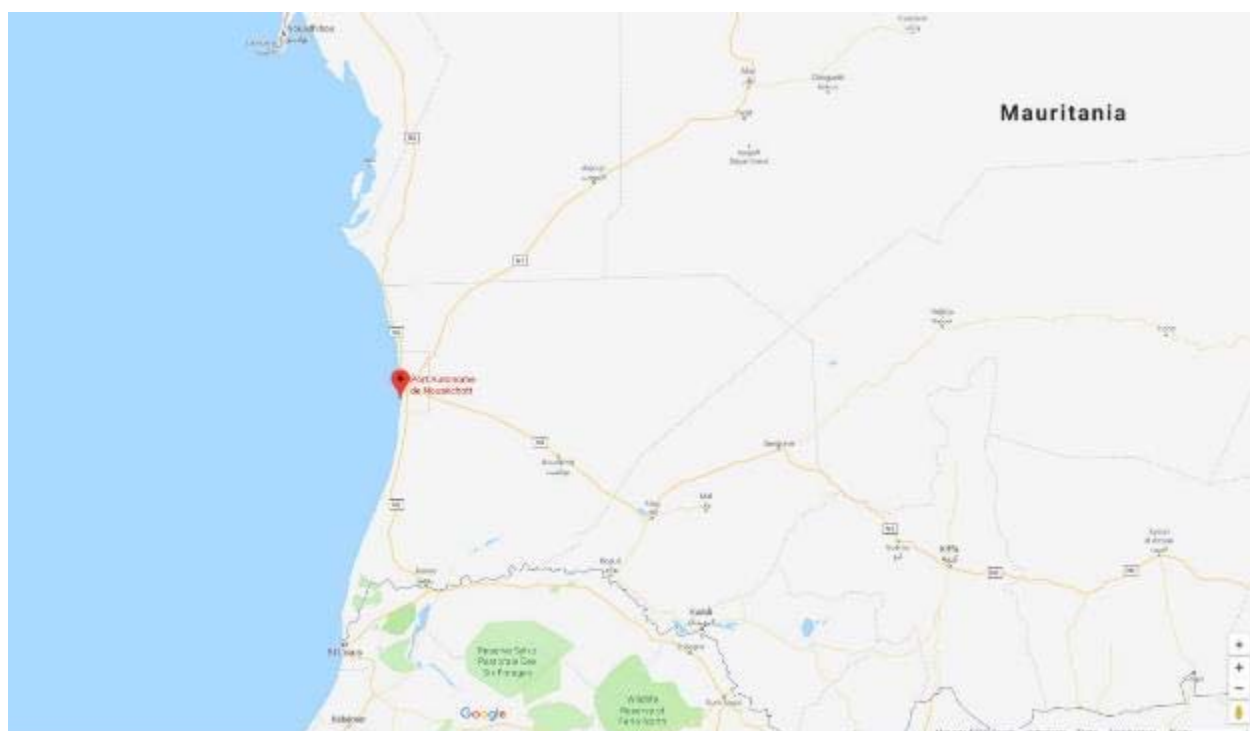


Figure 3-1: Location of the Port Autonome de Nouakchott dit Port de l'Amitié (Google Map)

3.2 Project Justification

3.2.1 Need for the Project

The PANPA is currently equipped with three general cargo and dry bulk berths that are located in the lee side of an artificial breakwater at the north of the port. The most recent development within the port was the construction of a new quay (creating four new berths) and deepening of the access channel in 2014.

However, the port is not to-date equipped with a dedicated container terminal, which is prejudicial for the country's commerce that heavily relies on containerised goods. With only two simple mobile harbour

cranes, loading and unloading of containers is not efficient, and in the long-term result in handling delays and increased costs of importing goods. Several studies have been carried out in the previous years to develop a dedicated container terminal, but none of them have lead so far to any concrete plans.

As per the Project's Feasibility Study (Royal HaskoningDHV, 2018), GDP growth for Mauritania is favourable, with long term figures showing between 5% and 6%, as indicated by IMF and Oxford Economics studies. Short term growth year-on-year until 2022 is also favourable with strong GD growth.

This high rate of growth is driven predominately by the country's two large export sectors; mining which accounts for 30% of national revenue (in 2016), and fishing, which accounts for approximately 20% of revenue. The Feasibility Study states that the port currently operates largely on imports, which in 2017 accounted for 88% of port activities. Thus, based on a projected 5.0% growth as indicated by the IMF, a large reliance on natural resources exports, and a significant need to maintain imports to match the forecasted economic growth; **the port will need to expand to keep up with current forecasts, and increase its capacity and capability of handling more goods, including a dedicated container terminal.**

A market study was recently prepared for the Project (Royal HaskoningDHV, April 2019) (hereafter referred to as '**the Market study**'), which confirmed these preliminary findings. This study describes the traffic forecasts for the port of Nouakchott up to 2040 differentiating the different sources of container and hydrocarbon traffic. The results are summarised below and basically show that the market is there to justify the additional handling capacity offered by the Project.

The sectors and market segment that could generate **container** traffic at the terminal include:

- The domestic market
 - Consumption (import)
 - The mining sector (export)
 - The fish industry (export)
 - Gas exploitation/exploration (import)
- The Corridor of Hope (Mali-North Bamako)
 - Consumption (import)
 - Raw material production (export)

As show on Figure 3-2 below, provided the infrastructure is in place at the port of Nouakchott, the container traffic could reach up to about 1.4 million TEUs (full + empty) in 2040 compared to about 0.16 million in 2018.

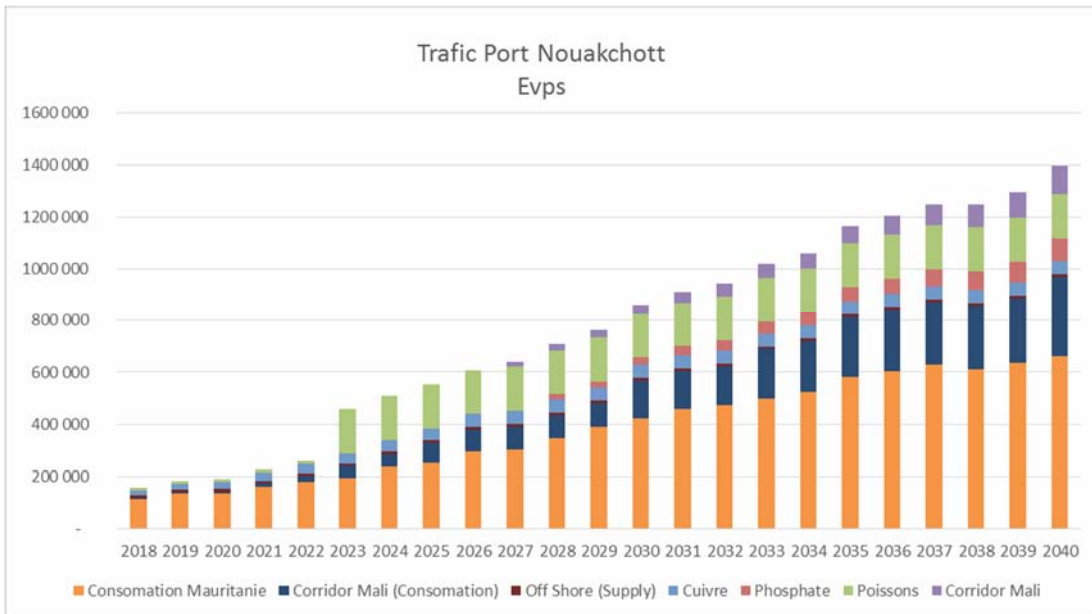


Figure 3-2: Base case container traffic forecasts for Nouakchott by 2040 (Royal HaskoningDHV, April 2019)

The **hydrocarbon traffic** of the port of Nouakchott consists of several potential markets and segments:

- Domestic market:
 - Domestic: transportation
 - Energy: domestic and industrial power generation
- International market
 - Mali supply chain
 - Bunkering for the fishing industry, oil & gas, or commercial vessels
 - Offshore operations

As show on Figure 3-3 below, provided the infrastructure is in place at the port of Nouakchott, the hydrocarbon traffic could reach about 2 million tonnes in 2040 compared to about 1 million tonnes in 2018.

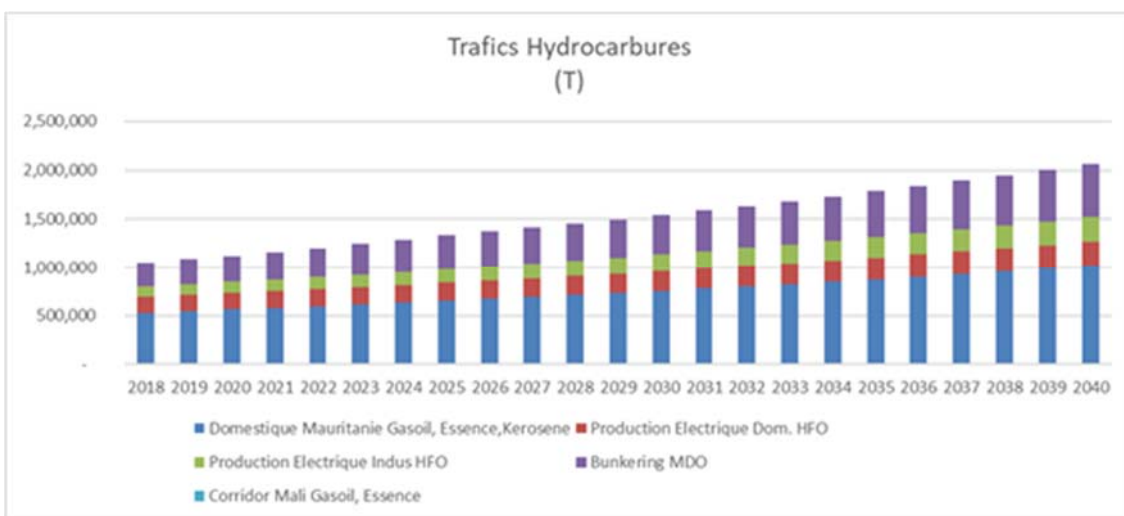


Figure 3-3: Base case hydrocarbon tankers traffic forecasts for Nouakchott by 2040 (Royal HaskoningDHV, April 2019)

3.2.2 Project Benefits

The Project offers benefits at the national and local community level. These include:

- A direct foreign investment of approximately 390 million USD over the project concession duration;
- Creation of employment opportunities for national workers during construction and operations;
- Creating opportunities for Mauritanian companies to provide services and supplies during construction and operation;
- Increasing the competitiveness of cargo handlers within the port; and
- Increase in potential import / export capacity from Nouakchott.

The project will also allow to reduce the cost of living of Mauritians thanks to the following factors:

- Imported containers will reach the country in larger vessels, which allows for economies of scale in the transport, and as a result, the price of imported goods in the country could benefit from this and be reduced.
- Hydrocarbon products will be imported directly to Nouakchott, instead of being first transhipped in Nouadhibou, which is a costly operation.

Specifically, for other economic operators within the port area, the project will have the following benefits:

- The extension of the breakwater will reduce the wave agitation in the port basin and as a result improve the downtime of the all port operations.
- Fisheries are expected to benefit from a new container terminal, as the export products will be able to be containerized in reefer containers, preserving quality and therefore also their value as an export product.

3.3 Project Components

The Project will be developed in different phases. At present only Phase 1 (as described below) is under consideration.

Table 3-1 presents the key components that will be constructed and/or operated as part of Phase 1 of the Project.

Table 3-1: Description of key project components

Component	Description
Main berth	<p>Size 570 m x 56.56 m wide accommodating container and general cargo berth and adapted for STS gantry cranes and mobile harbour cranes.</p> <p>The berth will be a deck built on piles. There will be a total of 384 piles for the quay consisting of 64 grids of 6 piles per grid. The piles will be constructed in situ using a vibro-hammer (not pile driven).</p>
Container yard	<p>Size 600 x 120m (7.20 ha) to accommodate containers, reefer containers and hazardous cargo containers.</p> <p>This yard will require 60,000 m³ of materials for reclamation.</p>
Capital dredging of the navigation channel and port basin	<p>Dredging to -15.7m depth of the navigation channel, turning circle and berth pocket and disposal of dredged material to offshore disposal sites.</p> <p>The dredging footprint is shown on Figure 3-4. The total length of the dredging channel is expected to be 7.57km. Dredging will consist in both the deepening of areas that have recently been dredged and the dredging of new areas. As described in the bathymetry section of this report (section 4.6.5), areas recently dredged include the existing turning circle and the approximately 4km long navigation channel which are both approximately 11-12m deep. New areas to be dredged include the additional 3.5km length of the navigation channel.</p> <p>In terms of dredging method, based on the available bore hole field data it is envisaged that the dredging contractor may deploy a Trailing Suction Hopper Dredger (TSHD) and that the discharge would be bottom discharge.</p> <p>The rate of dredging is expected to be 7,500-10,000 m³/hr.</p> <p>The time of completion is expected to be 5 months (including mob demob).</p> <p>Total volume of dredged material is expected to be about 5.2 million m³.</p> <p>Three sites (A, B and C) are considered for the disposal of dredged spoil, as shown on Figure 3-4. These sites were approved in 2011 by the Mauritanian Ministry of Equipment and Transport (MET) for the disposal of the dredged materials associated with the port extension works conducted by the Société Nationale Chinoise des Travaux de Ponts et Chaussées (SNCTPC). In March 2019, a letter was submitted by Arise to MET requesting the authorisation to use these sites for the Project. A copy of the letter is provided in Appendix 2. As of the date of issue of the present report the Authorisation was still pending.</p> <p>Provided authorisation is received, dredged spoil will be disposed primarily at disposal sites A and B. If required (to be determined during future dredging studies) disposal site C will be used.</p>
Extension of the existing breakwater	<p>Extension of the existing south-western oriented breakwater located on the groin north of the port. Objective of this extension is to reduce the wave agitation into the port</p>

Component	Description
	<p>basin. The length of this extension is still under study but is expected to be about 100m long.</p>
Hydrocarbon pipelines	<p>Provision of three oil and one gas pipeline from berth through trenches on berth and yard up to the existing junction point (Chinese yard) behind container berth. Approximate length of pipelines is 500 m.</p> <p>Demolition of the existing oil jetty and pipelines going from the oil jetty to the junction point.</p> <p>Out of the 2 berths, the northern berth shall be fully equipped for receiving oil tankers up to 50,000 DWT transfer pipelines and unloading facilities (hoses, valves) will be provided with necessary automation, cathodic protection, insulation, firefighting and electrical provisions as per relevant code.</p> <p>Note that the southern berthing station will only see the receiving pit and trenches but no equipment will be installed. It will act as provision for potential future requirements only.</p>
Power supply network	<p>Power supply, lighting, high mast, cabling, back-up diesel generators, earthing, substation equipment and building, cabling from substation to port equipment/facilities/buildings.</p> <p>The cabling from substation to port will be done via a 15kV distribution line along the 5 km right of way of the existing power line along the coastal road between Nouakchott and the port.</p>
Other facilities	<ul style="list-style-type: none"> • Permanent fencing of 1600 m and gates at required locations conforming to ISPS • Administration building, control room, workshop building, sanitary and rest area building • Upgrading of existing warehouses • Truck and car parking • Empty container yard (3.5 ha) • Navigation aids (2 port lights) • Weighbridge (1) at the entrance of the terminal • Reefer gantry (4) • Connection to national water supply, power supply and telecommunication networks • Storm water drainage including oil water separators • Waste water treatment plant (WWTP) which is planned to be installed in the administrative area (see figure 3-8) • Hazardous material and waste storage facility, including oil water separator • Workers accommodation camp, including container houses, sanitary facilities for the workers, recreational area, first aid centre, canteen, waste water treatment, administrative office, maintenance area and storage areas. • No fuel station will be installed within the new facilities. The existing fuel station within the global port facility will be used.

3.4 Project Layout

Figure 3-4 shows the high-level location of all the key project components, namely the new container and hydrocarbon terminal (NCT), the footprint of the channel and turning basin to be dredged, the potential dredged spoil disposal sites and the electrical substation.



Figure 3-4: Location of the key project components

Figure 3-5 shows the current layout of the port with the location of the different berths.

Figure 3-6 and Figure 3-8 show the NCT boundaries (outmost redline) as well as the conceptual design for Phase 1 project components, including the location of the new container and oil berths, the container yard and the areas that will be used in Phase 1 but redeveloped in Phase 2 (as shown on Figure 3-7 for information only as Phase 2 is not part of the ESIA scope).

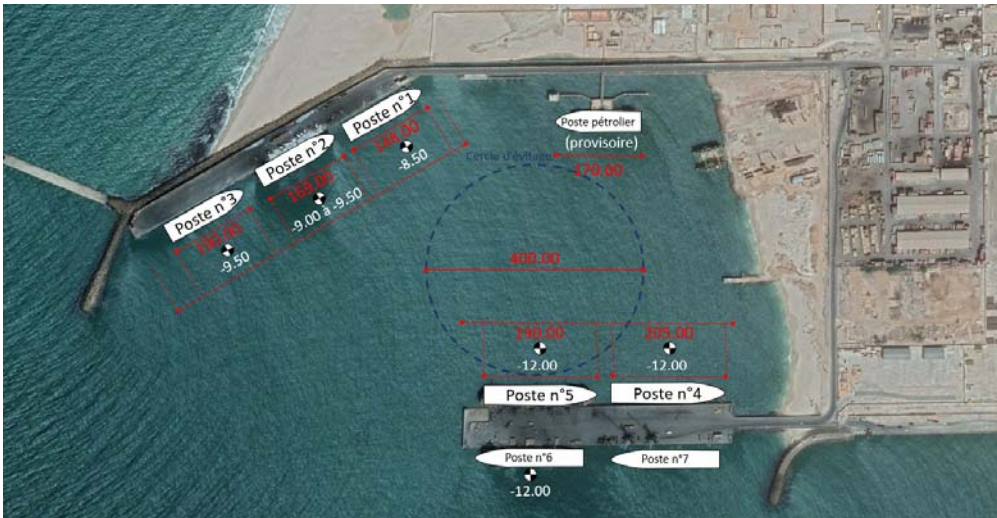


Figure 3-5: The port of Nouakchott and its existing berths



Figure 3-6: Conceptual design for Phase 1 components (Drawing No. NCT-EPC-1000-SHEET-1, November 2018, Afcons)



Figure 3-7: Conceptual design for Phase 2 components (Drawing No. NCT-EPC-1001-SHEET-1, November 2018, Afcons)

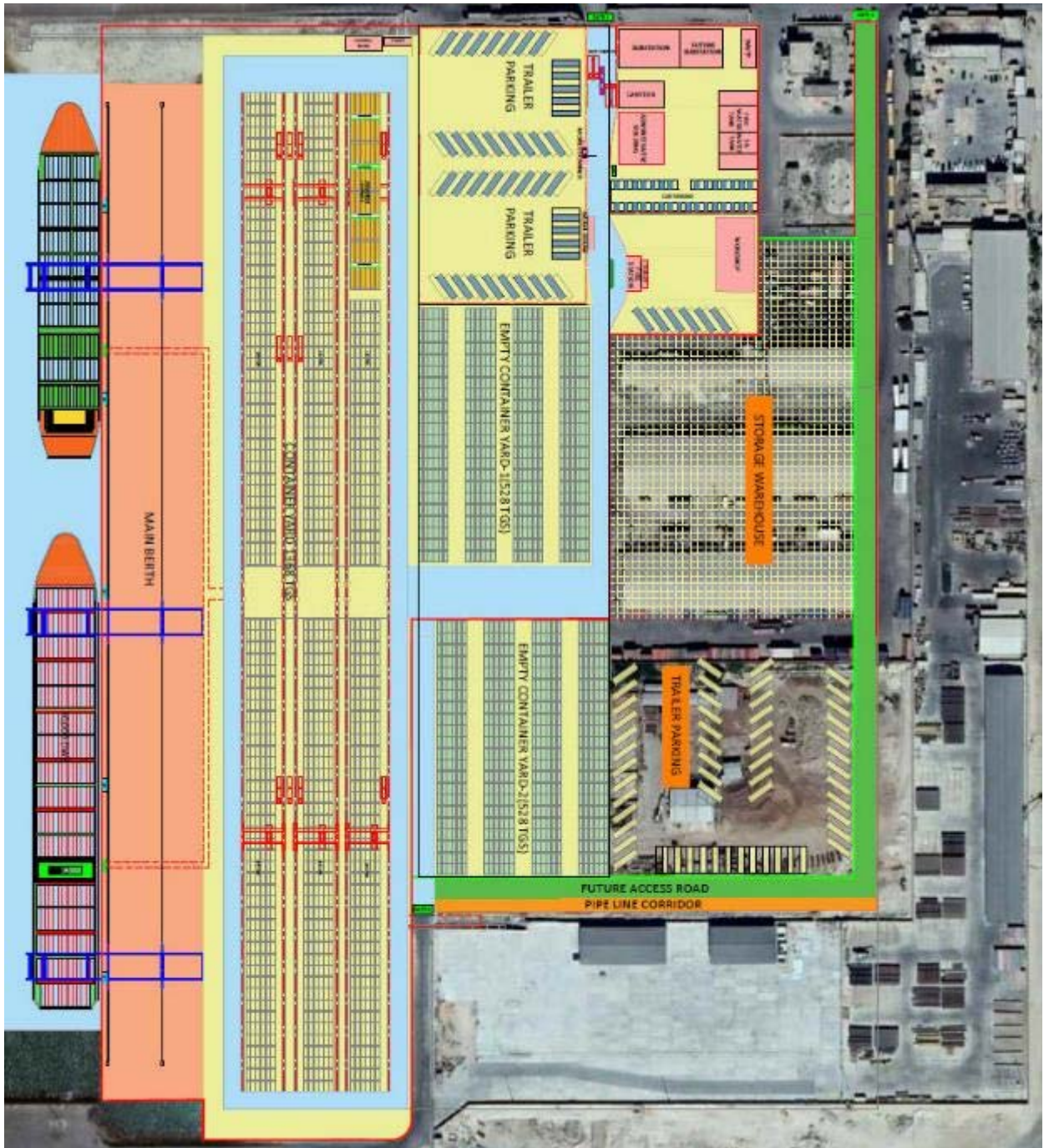


Figure 3-8: Conceptual design (detail) for Phase 1 components (Drawing No. NCT-EPC-1000-SHEET-1, November 2018, Afcons)

3.5 Project Activities

3.5.1 Construction Phase

Project construction activities entails the construction works associated with the Project components mentioned in Figure 3-9.

It is envisaged that the construction will starts in 2019 once Arise has all permits and land rights to start construction and the present ESIA has been disclosed and finalised based on comments received during the ESIA disclosure period. As shown on the indicative schedule given on Figure 3-9 below the construction period will take about 22 months with the following duration expected for each of the project construction activities:

- 16 months for the construction of the berth, including container yard and utilities;
- 8 months of building works;
- 3 months for the erection and testing of port equipment’s; and
- 5 months for dredging works at the end of the construction period.

Figure 3-9: Indicative Project execution schedule (Arise, March 2019)



AFCONS is the Engineering, Procurement and Construction Contractor (**‘the EPC Contractor’**) for the Project. The Contractor for the dredging works (**‘the Dredging Contractor’**) has not been selected yet. The EPC Contractor and the Dredging Contractor together with their own sub-contractors are further referred to in this document as **‘the Construction Contractors’**.

In terms of raw materials, sand will be sourced from an existing licenced sand mine within close proximity to the project area. Aggregates will be sourced from two existing quarries located 250 km from the site, in the Inchiri region. It was estimated that for the current requirements the two quarries identified would be able to supply all required material. However, if additional material is needed, there are other available existing quarries in the same area. Since the selected quarries already exist, they will be considered as a supplier.

Construction activities are expected to require about 750-1000 workers at peak, with about 350 expat skilled workers (50 management staff, 20 foreman/supervisor and 280 skilled workers) and 400-650 local workers.

All expat management staff (50) will be accommodated in the city area in rented accommodation. The EPC Contractor plans to construct a workers' accommodation for the construction expat workers (300). This accommodation camp will be within the Port area on land rented from the Port Authority just outside the ISPS boundary, so no land acquisition is required. This camp will include container houses, sanitary facilities for the workers, recreational area, first aid centre, canteen, waste water treatment, administrative office, maintenance area and storage areas.

It is understood that the EPC Contractor's laydown area will be located partly on an existing port operation site and partly on an empty area, all of which are within the port concession area (no land acquisition required). The laydown area will include concrete production (storage of and mixtures), temporary workshop, pre-cast yard, structural steel fabrication and painting.

3.5.2 Operation Phase

Project operation activities entail operations of the new multipurpose (container and hydrocarbon) terminal, including the new quay and the new container yard, as well as the occupation and use of some existing storage areas (which will be completely redeveloped as additional container yards in Phase 2). The terminal is designed for a handling capacity of 250,000 TEUs³ per year and 1.5 million tonnes per year of hydrocarbon products. Container vessels calling at the new terminal will have a capacity of about 5,000 TEU while the hydrocarbon vessels will have a capacity of up to 50,000 DWT⁴.

The handling capacity offered by the project combined with forecasts presented above mean there will be a higher number of vessels and trucks coming and leaving from the port during the operation phase of the Project compared to the current situation. However, as the new multipurpose terminal will make it possible for larger vessels to berth (up to 250m long vessels – 5,000 TEU capacity), the number of vessels per unit of volume of commodities transported is expected to decrease.

Compared to current oil berth, the new hydrocarbon terminal will make it possible:

- to have tankers coming to the PANPA directly, instead of having oil imports done through transshipment by coaster from port of Nouadhibou; and
- to offer bunkering services to fisheries and offshore oil & gas activities, instead of offshore bunkering.

During operation of the port 500 job opportunities (direct + indirect) are expected to be created.

³ TEU stands for Twenty-foot equivalent unit (a measure used for capacity in container transportation)

⁴ DWT stands for Deadweight tonnage (a measure of how much weight a ship can carry)

3.5.3 Decommissioning Phase

Decommissioning activities are not known at this stage and would also be closely related to the extent of decommissioning of the overall Port since more operators, each with their infrastructure, are present within the Port.

As such, the present ESIA doesn't include the decommissioning phase. It is recommended that impacts related to decommissioning are assessed at the end of the lifecycle of the infrastructure.

3.6 Project Alternatives

Several alternative lay-outs, and construction technologies have been considered throughout the ESIA and design stages. Below sections give an overview of these alternatives.

3.6.1 Alternative Site

Alternative sites (others than the present port site) have not been taken into consideration as all infrastructure is already situated inside the port area and the Project development actually entails a refurbishment / improvement of present infrastructure. Figure 3-10 shows the map of Mauritania and its hinterland with the main transport corridors to Mali and Senegal. Main corridors are the road to the dry port of Gogui at the border with Mali, and the road south to Senegal, with the border crossing at the Rosso bridge over the Senegal River.

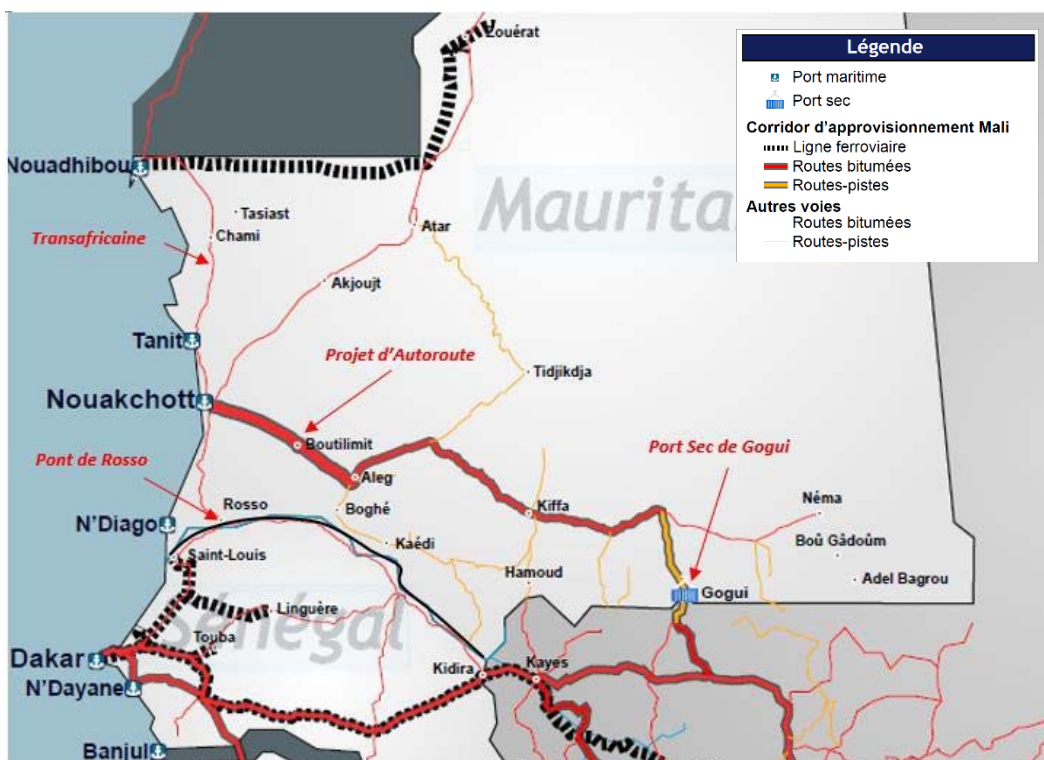


Figure 3-10: Port and connected inland transport infrastructure in Mauritania and Senegal

3.6.2 Alternative Terminal Layout

Several terminal layouts have been under consideration, these relate to the positions of both the quay and the oil jetty. Figure 3-11 below shows the two positions that were considered for the new quay with the requirement of a 350m width for the terminal:

- Build a quay that is perpendicular to the existing quays 4 and 5, with the back of the terminal corresponding to the current shore line. This option requires large volumes of reclamation because most of the yard would then be located where there is currently water.
- Build a quay that is perpendicular to the existing quay and starting at the root of the finger pier near the shore.

From a technical point of view, first option of the quay will be some 160m further out in the basin compared to the quay further “inland”. This will result in larger wave agitation and making it more difficult to keep vessels safe and stable at the quay. The breakwater is currently not long enough to allow for optimum protection against the waves.

Moreover, with the scenario of the quay further out, the volumes of reclamation will be much higher, as almost the entire surface of the yard will be on top of what is currently water. With the quay further inside the basin, the surface to reclaim appears to be approximately halved.

Finally, with the scenario of the quay further out, one existing berthing station will be lost on the intra-port side of the existing southern quay and the remaining berthing station may become difficult to operate when vessels are at the new proposed quay.



Figure 3-11: Alternatives for the position of the new quay

At the present stage, the preferred layout is the one depicted in Figure 3-6 and is determined after consideration on costs, constructability, operability and nautical aspects.

During the consultation held at the scoping phase it was suggested to relocate the hydrocarbon terminal outside of the present port site. However, this alternative (a separate dedicated hydrocarbon terminal) is not considered feasible and from an environmental point of view not advisable (e.g. additional encroachment/modification of shoreline, loss of the sheltering effect offered by the port rendering oil spills difficult to contain). From a technical point of view, the hydrocarbon terminal could have been relocated to the finger pier where berths 4 and 5 are located, but this would have led to operational difficulties due to a larger distance from the tank farm.

3.6.3 Alternative Construction Technology and Materials

There are several alternative construction technologies and materials being considered. The most relevant is the choice to build the quay as a “deck on piles”, partly onto land and partly above water. This requires only little reclamation. Further, the in-situ construction of the piles, which has been chosen over pile driving, is from an environmental point of view (noise and vibration) preferable.

3.6.4 Dredging Equipment

The two types of dredging equipment that could likely be used for this project are Trailing Suction Hopper Dredgers (TSHD) and Cutter Suction Dredgers (CSD). At present, based on the available bore hole field data it is envisaged that TSHD will be used; however, this needs to be confirmed by additional bore holes to be taken in the coming months.

3.6.5 Disposal Location

For the disposal of the dredged material three disposal sites (A, B and C) were initially considered, as shown in Figure 3-4. At the present stage, based on the expected volume of dredged spoil and the proximity to the Project site, the plan is currently to only use site A and B for the disposal of dredged materials.

From an environmental point of view, the disposal sites A and B are preferable because they are located closer to the port and therefore the use of these sites will lower the emissions from engine and exhaust of vessels used to transport dredged spoil. Disposal site A was also mentioned by the local fishing group FLPA (Fédération Libre de la Pêche Artisanale) as their preferred site, as it is one of the least preferred fishing zone. Finally, the results of the marine baseline survey showed that there are some sensitive habitats present in site B. In site A and C no sensitive species/habitat were identified. The exact sensitivity of the habitat in all three sites will be further investigated during the development of the Dredging Management Plan (DMP) and appropriate measures will be taken to minimise the impact on this habitat.

The reinforcement of the dunes north of the port or reinforcement of the beach to the south of the port could be another solution to the disposal of dredged material. Depending on the characteristics of the sediments, additional studies and further discussions with the Ministry of Environment. this solution could be put in place to reinforce the (natural) coastal protection system already in place.

3.6.6 No-Project option

The ‘No-Project’ alternative option concerns the environmental and social outcomes should the terminal development not go ahead. As explained in above section 3.2, with the no-project option, there is a risk that the existing port will not be able to accommodate (or be developed to accommodate) increasing throughputs of containerised and non-containerised cargoes in future, which would hinder economic development in Mauritania and, particularly, the city of Nouakchott. In addition, with the no-project option, the opportunity would be lost for environmental and social improvement of present port operation activities.

4 Environmental and Social Baseline Conditions

4.1 Introduction

This section provides information on the social and environmental parameters and sensitive receptors that are considered to be at risk or being impacted by the construction and/or operational activities of the proposed Project, as identified based on literature review, field trips (including stakeholder consultation) and the experience of our experts in similar projects.

Baseline data was collected during the scoping and baseline studies, such as previous ESIA studies, field surveys, scientific publications and reports. Two field trips were conducted to understand the baseline environment and conduct stakeholder engagement:

- a field reconnaissance trip during the scoping study (19-23 November 2018), and
- a field survey trip during the ESIA study (21-30 January 2019).

4.1.1 Indicators, receptors and resources

The following environmental indicators, receptors or resources affected by the Project activities were considered:

Physical environment:

- Air quality and climate;
- Noise and vibration;
- Soils and land quality;
- Surface hydrology, groundwater and water quality;
- Coastal geomorphology, coastal processes and sediment transport;
- Marine water and sediment quality;

Biological environment:

- Protected area designations;
- Terrestrial ecology;
- Marine and coastal ecology;
- Ecosystem services;

Human environment:

- Visual amenities;
- Communities;
- Economics and livelihood;
- Infrastructure; and
- Cultural heritage.

Information on the existing physical, biological and human environment makes it possible to determine the sensitivity of the environment and can then be used as a benchmark against which subsequent changes can be determined and/or evaluated later through monitoring phase.

4.1.2 Project Area of Influence

The Area of Influence (**AoI**) for this project includes:

- The Project's direct footprint (the Port area, including dredging and disposal areas, and electric line and substation tie-in);
- The indirect area of impact affected by the sediment plume arising from dredging and disposal;
- The local road network including the primary roads to and from the Port;
- Stakeholders identified within the Aol

For this baseline description, the study area is defined as the direct Project footprint, and the environment immediately surrounding within 5-7km of the project site. This area of influence includes all Project activities, as well as their direct and indirect impacts. This area is represented on the map in Figure 4-1.



Figure 4-1: Project Area of Influence

4.2 Air Quality and Climate

4.2.1 Climate

Nouakchott features, throughout the year, a hot desert climate with high temperatures, and virtually no rainfall. Average rainfall and temperature in the region are respectively 94mm per year, and 25.8°C. Monthly mean temperature and rainfall for a typical year can be seen in Figure 4-2. The climate in Nouakchott is classified as BWh (i.e. desert climate) by the Köppen-Geiger system.

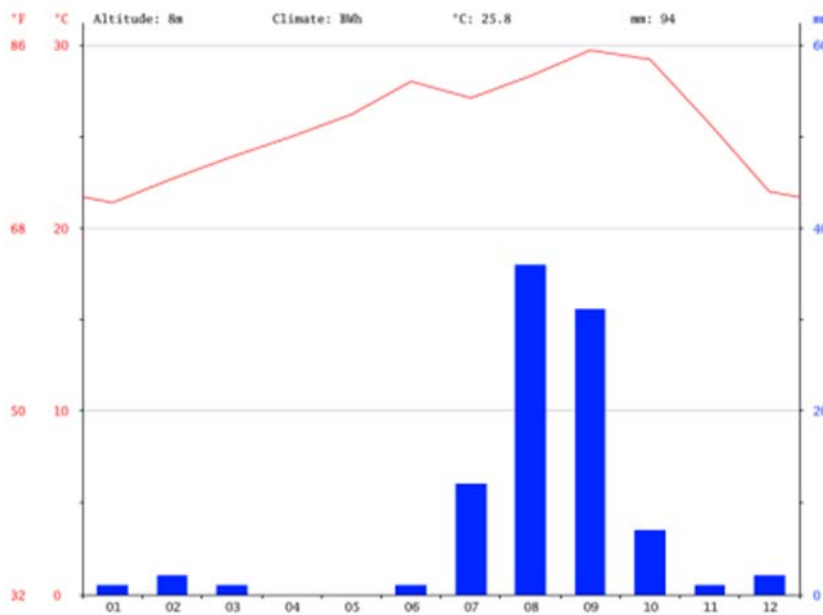


Figure 4-2: Annual mean temperature and rainfall for Nouakchott. Source: (CLIMATE-DATA.ORG, 2018)

The driest months are April and May with an average rainfall of 0mm. With an average of 36mm, the most precipitation falls in August. The warmest month of the year is September, with an average temperature of 29.7 °C. January has the lowest average temperature of the year with 21.4 °C.

Wind direction is predominantly north-westerly and north-easterly, as can be seen in Figure 4-3.

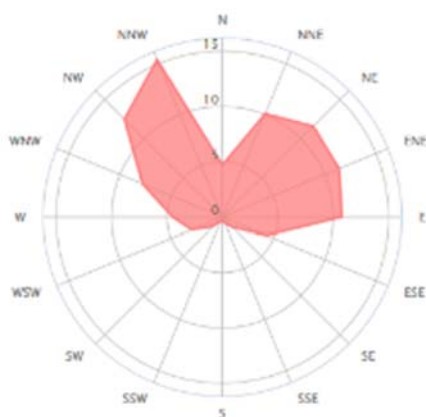


Figure 4-3: Wind direction distribution (percentage) for Nouakchott, based on observations taken between October 2010 and January 2018 daily (Windfinder, 2018)

4.2.2 Air Quality

As the project area is surrounded by desert sand, dust levels are assumed to already be high. This was noticeable over several days during site visits when prevailing winds led to visible high amounts of sand and dust in the air.

The project area is located in an existing port and industrial zone where the airshed is expected to be degraded with particulate matters (PM₁₀ and PM_{2.5}) and gaseous pollutants associated with exhaust engines (e.g. SO₂, NO₂); and potentially industry specific emissions such as cement dust from the cement plant and VOC emissions from the oil tank farm.

4.3 Noise and Vibration

Baseline levels for noise and vibration are already assumed to be relatively high, as the port site is in an industrial area with high levels of activity within the port, road traffic, and industries such as cement plant, aggregate and ballast material crushers and stockpiling, and commercial mills which are present within the defined Area of Influence.

4.4 Soil and Land Quality

4.4.1 Topography

The area surrounding the port comprises of low-lying coastal flats. The shoreline to the north is protected by relatively low sand dunes, which are prone to flooding, whilst to the south, a system of levees has been constructed to provide protection from coastal inundation (see Image 4-1). During both site visits, it was reported that the Government had banned vehicles driving over the dunes and onto the beach to protect their structure. Small shrubs and grasses were seen on the dunes, providing some stability; it was further confirmed during a meeting with the Wilaya that this is part of active dune regeneration.



Image 4-1: Maintained levee to the south of the port, looking towards the port. The Atlantic Ocean is on the left of the image

4.4.2 Soil quality

4.4.2.1 Along the pipelines route

The route of the oil pipeline does not show visible evidence of oil contamination and it was reported by Port Authorities that there is no historical records of oil spills in the port area. No assessment of waste management practice was conducted inside the port facility; however, the area did appear relatively clean and tidy.

In order to determine the soil quality baseline and to assess soil management for that which will be excavated for pipeline removal, soil quality samples were taken at the land areas of the port where the quay and the new pipeline will be constructed. The identified sampling sites included the areas where the pipeline was curbed (there is more pressure, and so more likely to be weaknesses in the curbs) as well as those sections where the pipelines travels underground that is where visual inspection cannot be made. Examples of these areas are shown in Image 4-2.

The existing oil and gas pipelines measure 810m from the point where they stretch over dry land, until they reach the junction box located in the future laydown area. The pipelines run predominantly above ground except for three sections where they run underground for lengths of 25m each.



Image 4-2: Two locations where soil testing will be conducting along the route of the existing pipeline; areas where the corners in the pipe occur and stretches underground.

A total of 9 samples were taken along the route of the pipeline, at intervals of 100m. Figure 4-4 shows the location of the sample points.

At each sample location, consolidated core samples were taken by boring manually 1.2m deep. The core was thoroughly mixed on clean plastic sheeting to avoid potential contamination, divided in four equal parts with two parts combined and put into a sampling jar. No groundwater was encountered during the sampling.



Figure 4-4: Location of sampling points along the pipeline route

The samples were sent to an accredited laboratory in the Netherlands (Eurofins Analytico B.V.)⁵ for analysis of the following parameters: Metals (arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead and zinc) and Petroleum hydrocarbons (C10-C40).

In the absence of soil quality standard in Mauritania, the results of the chemical analysis (full results are provided in **Appendix 3**) were compared with the Dutch soil and groundwater standards⁶ which are generally accepted worldwide. The Dutch intervention levels are based on risk assessment for both ecology as well as human health and therefore provide a good indication for the potential risks related to soil contamination.

⁵ Due to unforeseen customs regulations, the delivery of the samples to the laboratory was delayed with 1.5 weeks. The laboratory protocol prescribes that samples should be cooled during the shipment to the laboratory. Due to the delay, the samples have been without proper cooling longer than is desired. This may potentially affect the sample quality and in some cases, result in lower results due to biological or chemical processes that could occur with higher temperatures. However, during the period of shipment the samples were unopened (no contact with oxygen, which could enhance oxidation of the soil) and packed in isolated boxes with ice packs which reduces those risks. Based on the results of the samples and field observations, it is our opinion that the shipment delay has not significantly affected the quality of the samples. We therefore conclude that the quality of the soil is sufficiently determined and no risks or remediation requirements are applicable.

⁶ Circulaire bodemsanering 2013, Appendix 1. Can be found on: <https://wetten.overheid.nl/BWBR0033592/2013-07-01>

The Dutch standards are based on a standard soil type with 10% organic matter and 25% Lutum (fraction <math><2\ \mu\text{m}</math>). Since the organic matter and Lutum content were not determined the intervention levels were corrected for the worst-case scenario: 2% humus and 2% Lutum. Practically this means that the analytical results are compared to the lowest intervention values, for soil types with the lowest absorption capacity, and therefore potentially the highest risk.

In Table 4-1 the analytical results, as well as the applied standards are shown. The table provides direct insight in the verification of the results against the standards.

The assessment shows that:

- The barium content in all samples exceeds the detection limit, but is well below the intervention value;
- In sample points NCT-1T, NCT-2T, and NCT-3T the barium content appears relatively higher than in the other samples. Since these three points are adjacent to a port road with high circulation levels, higher levels of barium may be related to fuel combustion from the trucks and other vehicles;
- The chromium concentration exceeds the detection limit in 7 out of 9 samples, but is well below the intervention value for chromium;
- The copper concentration exceeds the detection limit in samples NCT-2T and NCT-3T, but is well below the intervention value for copper;
- The zinc content exceeds the detection limit in all samples but is well below the intervention values.
- The extractable petroleum hydrocarbons (EPH) content is lower than the detection limit in all samples except for sample NCT-2T. The concentration of 39 mg/kg dry matter is however just exceeding the detection limit and therefore negligible when looking at potential risks.

The baseline investigation performed for the oil pipeline in Nouakchott port has not found any concentrations of investigated parameters (metals and petroleum hydrocarbons) to exceed the intervention values based on the Dutch soil standards. Given the current use of the site, no risks or remediation requirements are anticipated for future site (port) activities or site development.

Table 4-1: Results of soil sample analysis along the route of the pipeline. The chemical analysis results are compared with the Dutch intervention values. The detection limit and the (corrected) Dutch intervention value is also shown for all parameters.

Sample	Arsenic	Barium	Cadmium	Chromium	Copper	Mercury	Molybdenum	Nickel	Lead	Zinc	EPH (sum)
NCT-1T	<5,0	150	<0,40	<5,0	<5,0	<0,10	<1,5	<5,0	<10	19	<38
NCT-2T	<5,0	170	<0,40	6,5	7,7	<0,10	<1,5	<5,0	<10	52	39
NCT-3T	<5,0	120	<0,40	7,4	5,2	<0,10	<1,5	<5,0	<10	17	<38
NCT-4T	<5,0	59	<0,40	7,9	<5,0	<0,10	<1,5	<5,0	<10	8,2	<38
NCT-5T	<5,0	42	<0,40	5,9	<5,0	<0,10	<1,5	<5,0	<10	11	<38
NCT-6T	<5,0	37	<0,40	<5,0	<5,0	<0,10	<1,5	<5,0	<10	6,8	<38
NCT-7T	<5,0	47	<0,40	5,7	<5,0	<0,10	<1,5	<5,0	<10	6,2	<38
NCT-8T	<5,0	29	<0,40	6,5	<5,0	<0,10	<1,5	<5,0	<10	6,7	<38
NCT-9T	<5,0	62	<0,40	6,7	<5,0	<0,10	<1,5	<5,0	<10	11	<38
Detection limit	5	15	0,4	5	5	0,1	1,5	5	10	5	38
Corrected intervention value	34,3	237,4	7,6	54	54	25	190	34,3	336,7	303	1000

 = exceeds Dutch intervention value
 = below Dutch intervention value

4.4.2.2 Along the transmission line

The required trenching for installation of a 15kV electric cable adjacent to the coastal road connecting the city similarly showed no signs of spill contamination, on either side of the road, as shown in Image 4-3. However, trucks and lorries were seen parked adjacent to the road, which may lead to small traces of oil or fuel dripping on to the ground if they are poorly maintained, as seen in Image 4-4.



Left: Port entrance, looking north; Right: 500m from port entrance, looking north



1km from port entrance, looking north (left) and south (right)



1.5km from port entrance, looking north (left) and south (right)



2.15km from port entrance, looking north (left) and south (right)



3.2km from port entrance, looking north (left) and south (right)



4.km from port entrance, looking north (left) and south (right)



4.85km from port entrance, looking north (left) and south (right)



5.5 km from port entrance, looking north (left) and south (right)



Image 4-3: Series of images showing the view looking north and south along the proposed route of the new electrical power cable and gas line, running north from the port for 6.5km.



Image 4-4: Trucks parked alongside of road; if the trucks are poorly maintained, it could result in oil dripping onto the gravel/dirt below.

4.5 Surface Hydrology, Groundwater and Water Quality

To the south of the port, a barrier system of levees has been constructed to provide defence against coastal inundation, as shown in Image 4-1. This has resulted in the development of wetland areas.

No signs of (elevated) groundwater were seen within the port facility; the current route of the oil pipeline is largely above ground, on elevated stands and situated on a raised berm. No groundwater was found within 1.2m of the surface during testing soil sample collection.

4.6 Coastal Geomorphology, Coastal Processes and Sediment Transport

4.6.1 Coastline evolution

The coastal front of the city of Nouakchott, characterized by a straight, flat, sandy shore is exposed to northwest swells. Currents from north to south result in longshore drift; coastal erosion is a known concern along the coast (HACHEMI, et al., 2014). First works for the Port de l'Amitié development started in 1979 and was completed in 1986. The second phase of development was engaged in 2014 with the construction of the southern jetty. The construction of the Port of Nouakchott has led to a rapid coastline evolution that has resulted in a build-up of sand (accretion) to the north, and a significant erosion to the south of the port. Studies have shown that between 2004-2010, the shoreline has moved 14m/year seaward and eroded 20m landward to the south.

To update the shoreline evolution understanding, DHI has recently conducted a hydro-sediment study (as part of the marine modelling studies presented under **Appendix 5**) by comparing shoreline position from 1980, 1998, 2003, 2009, 2012, 2016 and 2018. Results are presented on Figure 4-5. The addition of the recent shoreline position confirms the past trend of evolution, with a continuation of accretion north of the harbour and erosion south of it. However, it has to be noted that after the construction of the breakwater in 2012 which is about 2km south of the port, the erosion has been significantly reduced between this structure and the harbour. In return, the hot spot for intense erosion has been reported south of the breakwater.

For the period 1980-2018, DHI noted the following:

- The accretion trend is relatively stable, with a slight reduction of intensity in the recent year, for profiles 1 and 2: 800m of accretion and 200m respectively
- A significant erosion for profiles 4 and 5 (about 750m) which has been stabilized over the last 2 years (2016-2018)
- A significant erosion for profiles 6 (about 800m) and 7 (about 700m), with a slight increase of intensity over the 2 last years.



Figure 4-5: Shoreline mobility during the period 1980-2018 (DHI, May 2019)

4.6.2 Tidal current flow regime

The offshore current circulation along the Mauritanian coast is characterized by the northward Mauritanian current. The large-scale horizontal circulation is schematically illustrated in Figure 4-6. The North Equatorial Current (NEC) and the Canary Current (CC) to the west form the eastern boundary of the North Atlantic subtropical gyre. Near-shore, a strong wind-induced coastal upwelling is active the extent of which varies depending on the season. A density front develops that generates the coastal jet, also named Canary upwelling Current (CanUC). South of Mauritania, the circulation is dominated by the North Equatorial Counter-Current (NECC), which has a large seasonal cycle. It is located near 5°N in winter and reaches 10°N in summer. During the summer, it continues further north and develops into the Mauritania Current (MC), which flows northward until about 20°N.

The Atlantic North-eastern Tropical Upwelling System is characterized by permanent currents (dark gray), seasonal currents in winter-spring (green), seasonal currents in summer-autumn (blue) and an upwelling area (gray shading). Dash line corresponds to currents not evidenced by in-situ measurement, but visible in circulation derived from altimetry.

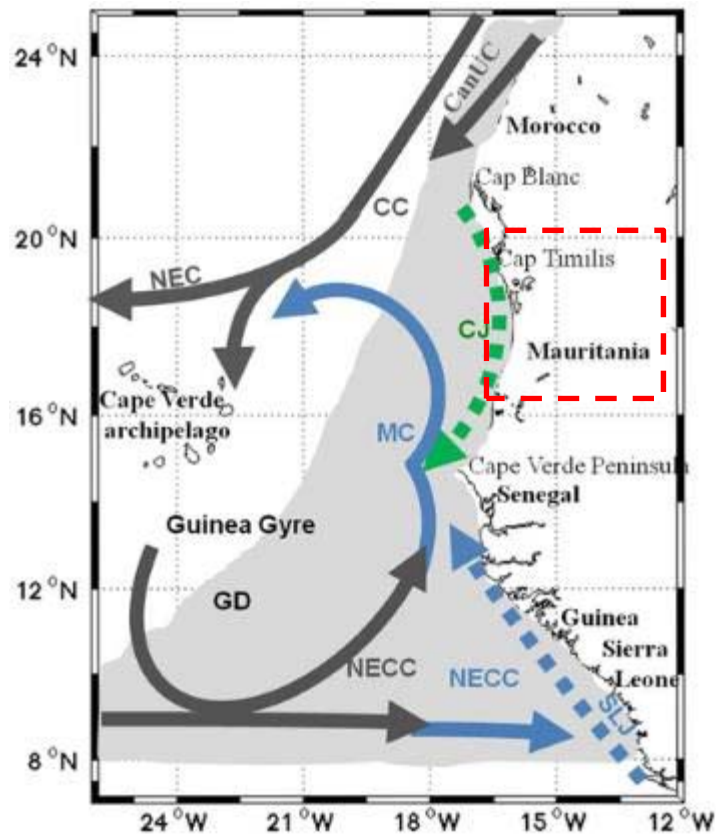


Figure 4-6 Map showing the schematic oceanic circulation pattern along the NW African Margin

4.6.3 Temperature regime

Figure 4-7 presents the seasonal variation of the surface wind sea surface, the surface temperature and the near surface chlorophyll intensity along the Mauritanian coast. This clearly illustrates the upwelling phenomena that takes place during the winter. The sea temperature near Nouakchott appears to vary from 15-17°C in winter-spring, up to 25-27°C in summer-autumn.

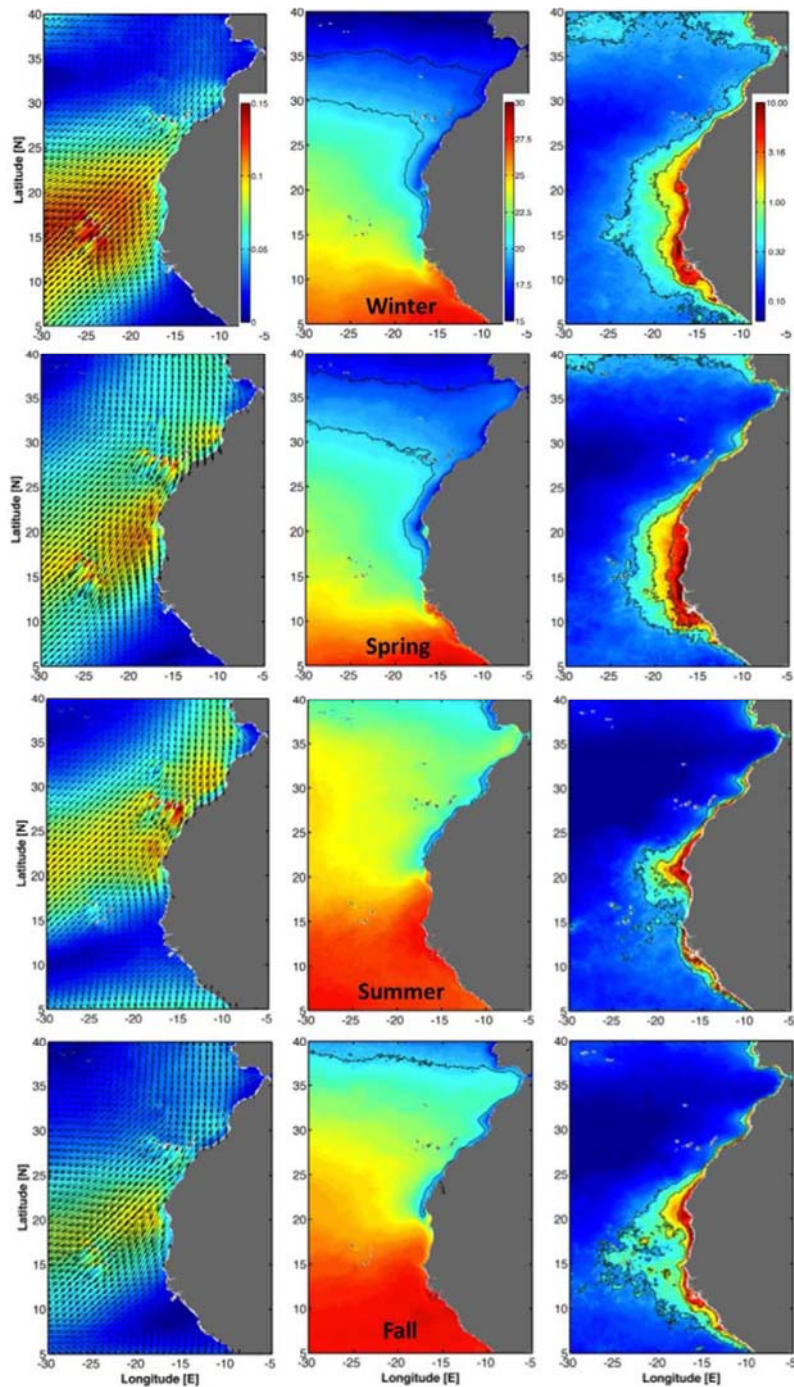


Figure 4-7 Map Distribution of surface wind (left), sea surface temperature (middle) and near surface chlorophyll (right). From top to bottom: winter, spring, summer, autumn)

4.6.4 Wave conditions

The marine modelling studies ([Appendix 5](#)) describe the wave conditions in the nearshore environment near the port of Nouakchott.

The predominant wave direction is from west-north-west and northwest. The most frequent wave heights are between 0.5 and 1 (~51% of the time), and between 1 and 1.5 m (~40.5% of the time). The most

frequent peak periods are between 6 and 8 s (~46% of the wave conditions) and between 8 and 10 s (~40.5% of the wave conditions). The wave rose presented in Figure 4-8 illustrates the wave heights and direction near the coast.

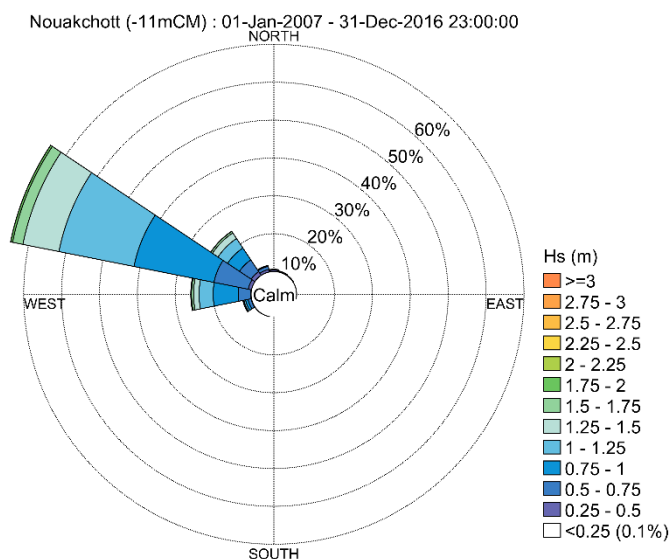


Figure 4-8 Wave roses in front of Nouakchott at -11 m LAT (bottom) for the period 2007 – 2016.

DHI modelled the effect of the deepening of the channel and the reduction in bathymetry at the disposal locations induced by the dredging and disposal of dredging material on the wave conditions. The modelling results show that the deepening of the channel induces an increase in the wave heights near the channel. In addition, it plays a large role in the wave propagation towards the port.

The reflexion of the incoming waves at the channel slopes close to the entrance of the harbour leads to a concentration of significant increase in wave energy inside the northern part of the harbour (up to ~+30%). Whereas in the other parts of the harbour the wave energy is significantly reduced (down to ~-30%). The adverse effect of the increased wave energy in the Northern part of the harbour could be mitigated by extending the breakwater directed southward which is located at the channel entrance. The extension of this breakwater prevents the waves reflected away from the channel slopes to enter the harbour.

4.6.5 Bathymetry

The coastal zone (within the 12-mile zone) is relatively shallow with a maximum depth of 20 meters. In 2014, the Chinese National Society of Bridge Works and Roads (SNCTPC) constructed a new pier including four berths in the port of Nouakchott. As part of this project an access channel was dredged to 12 meters and the port basin was dredged to a maximum of 13 meters in 2014 (ESIA, 2010). To date no maintenance dredging was required as the infill of sediment in the channel and the port was limited. For the present project the channel will be dredged to a maximum depth of 15.7m. At this stage, it is unclear how often maintenance dredging will be conducted in the new situation. However, in this ESIA we expect some maintenance dredging will take place.

At the beginning of February 2019 Magma conducted a bathymetric survey (Magma, 2019). The survey covered the port basin, the area of the existing access channel and the disposal sites A and B (based on

the initial volume of dredged spoil estimated, disposal site C was not considered and therefore not part of this bathymetry survey).

Results are reported on Figure 4-9 and Figure 4-10 below and show the following:

- The depth of the port basin varies from 3-11 meters with a depth of 10-11 meters in the turning circle.
- The existing access channel is 11-12 meters in depth.
- North and South of the access channel the depth is 8-10 meters
- The depth of the disposal site A is 8-10 meters. The depth increases with the distance from the shore.
- Disposal Site B is 9 – 12 meters in depth. The depth increases with the distance from the shore.

Based on the bathymetry survey it can be assumed that since 2014 a maximum infill of 2m has occurred in the channel and the port basin.

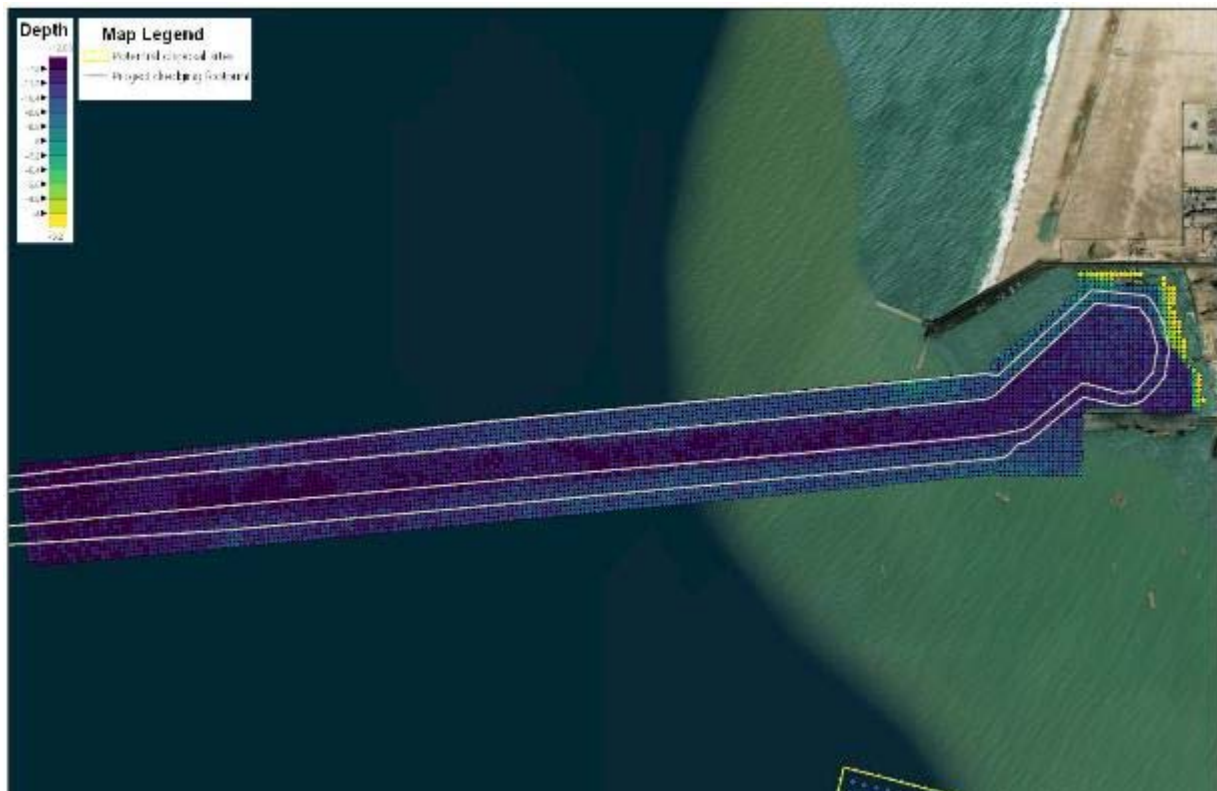


Figure 4-9: Bathymetry of the entire port basin and current access channel route Map Mesh (20m x 20m) based on results of Nouakchott Container Terminal Bathymetric Survey (Magma, 2019)

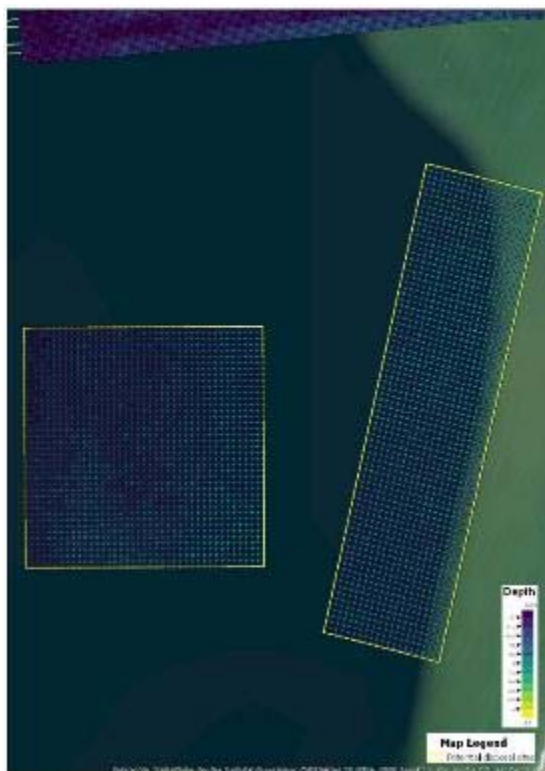


Figure 4-10: Bathymetric survey of disposal site A and B based on results of Nouakchott Container Terminal Bathymetric Survey (Magma, 2019)

4.6.6 Sediment particle size

In order to establish the physical characteristics of the sediments to be dredged and the areas where it will be potentially disposed, surface sediment samples (as shown in Figure 4-11) were taken within the footprint of the Project, and particle size analysis (PSA) undertaken. The results of this survey are included in the report 'NCT ESIA – Marine Survey – Report of sampling and analysis mission' prepared by Magma 2019 (hereafter referred to as '**the Marine survey report**') and provided in **Appendix 4**.

The sediment samples that were analysed show that the sediments consist of a dominant sandy texture (grain diameter between 2 and 0.063 mm with a mean grain size 1.27-2.73 phi) except for station 2 which consists of a finer texture with a grain size of less than 0.063mm (corresponding to mud (silt and clay)). For some of the stations (ST 3, 6, 9, 12 and 14) the sediment samples also contained a relatively high mud fraction (a third or more). The coarse sediment reflects the strong hydrodynamics in the area with finer particles generally in the more sheltered areas. The sediment is classified according to the Wentworth scale (Table 4-2). The main results from the particle size analysis are presented in Table 4-3.

Table 4-2: Classification sediment according to Wentworth Scale

Scale phi	Size range (metric)	Aggregate name (Wentworth class)	Other names
<-8	>256 mm	Boulder	Gravel
-6 to -8	64–256 mm	Cobble	
-5 to -6	32–64 mm	Very coarse gravel	

-4 to -5	16–32 mm	Coarse gravel	
-3 to -4	8–16 mm	Medium gravel	
-2 to -3	4–8 mm	Fine gravel	
-1 to -2	2–4 mm	Very fine gravel	
0 to -1	1–2 mm	Very coarse sand	Sand
1 to 0	0.5–1 mm	Coarse sand	
2 to 1	0.25–0.5 mm	Medium sand	
3 to 2	0.125–0.250 mm	Fine sand	
4 to 3	0.0625–0.125 mm	Very fine sand	
8 to 4	0.0039–0.0625 mm	Silt	Mud
10 to 8	0.00098–0.0039 mm	Clay	
20 to 10	0.0000095–0.000987 mm	Colloid	

Table 4-3 Results PSA analysis at each marine station.

Station	% Mud	% Sand	%Gravel
ST1	3.6	95.6	0.86
ST2	98	0	0
ST3	37.7	71.2	1.4
ST4	8.4	83.0	9.2
ST5	5	94.3	1.0
ST6	44.2	69.0	0.3
ST7	11.3	88.9	0.9
ST8	23	78.1	3.25
ST9	34	74.4	0.138
ST10	22.4	81.4	0.28
ST11	7.7	92.0	0.84
ST12	29.2	77.2	0.23
ST13	16.3	84.0	2.0
ST14	30.8	75.5	0.93

The 'Etude d'impact environnemental et social du terminal à conteneurs au Port de Nouakchott (PANPA)' conducted in 2010 (hereafter referred to as 'the 2010 EIA') presents the results of a geotechnical (borehole) study, undertaken within the port basin. The results demonstrated that the upper layers of sediment comprise a thick layer of sand (1 to 2 m thickness), followed by 3 m of conglomerated shells. Surface samples were also taken within the port basin's turning circle. The results demonstrated the presence of fine, slightly silty sand.

4.7 Marine Water and Sediment Quality

4.7.1 Existing information

The 2010 EIA mentions that the poor waste sanitation in Nouakchott results in significant volumes of sewage being discharged from septic tanks on the coast.

As part of the 2010 ESIA borehole, samples were analysed for the presence of contaminants and classified against the LAGA (*Groupe de Travail des Déchets des Länders*) sediment quality criteria. The results demonstrated exceedances of the Z1 criteria (as defined by LAGA) for Total Organic Carbon (TOC), Mercury and Zinc. There were no exceedances for polychlorinated biphenyl (PCBs), polycyclic aromatic hydrocarbon (PAH), tributyltin (TBT). The 2010 EIA outlines that despite of the proximity of the city of Nouakchott, the overall marine waters and sediments quality in the vicinity of the port are good. However, in the 2010 EIA no water quality samples were taken.

Given the lack of data to enable an assessment of impacts on water and sediment quality an additional survey was conducted as outlined below in section 4.7.2.

4.7.2 Methodology

In order to determine whether the dredging and disposal of sediments will cause the resuspension of contaminants, water and sediment samples were taken at fourteen locations within the project footprint including the potential disposal sites. Only three samples were taken in the existing channel footprint. Additional samples may be taken to cover the complete channel length at a later stage while preparing the Dredging Management Plan (DMP). Figure 4-11 shows the locations of the marine survey stations.

At each station, a standard 0.1 m² Van Veen grab was deployed to collect a surface sediment sample which was then transferred into appropriate containers and kept cool ready to be sent for analysis. At the same stations water samples were taken with a 5L Niskin bottle. Analyses of the following sediment physio-chemical parameters was undertaken by Greenlab and Eurofins (both accredited labs):

- Ammonium
- Nitrogen
- Phosphorus
- Nitrites
- Nitrates
- Poly-Aromatic Hydrocarbons (PAH)
- Total Hydrocarbons Concentration (THC)
- Tributyltin (TBT)
- Total Organic Carbon (TOC)

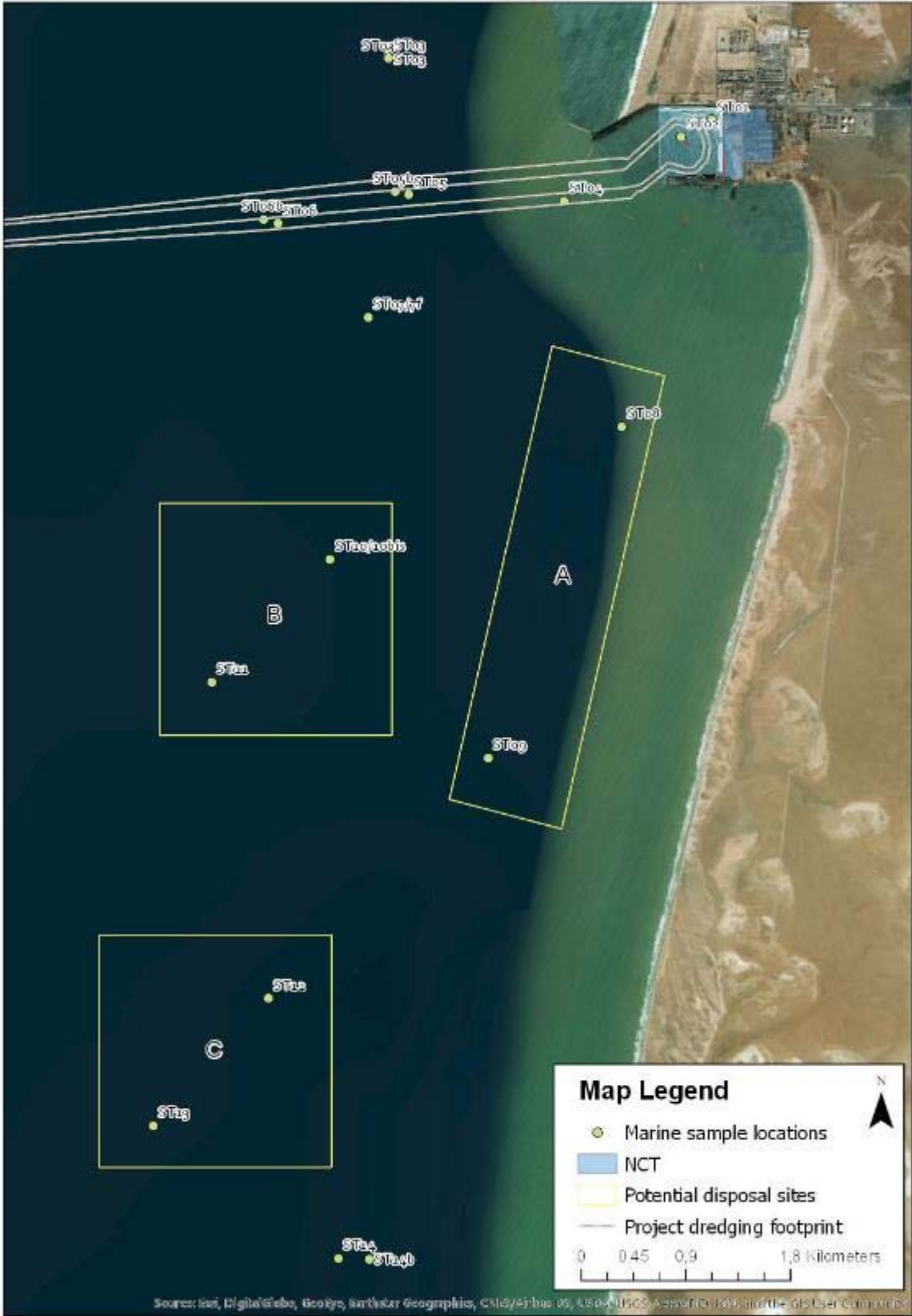


Figure 4-11 Marine survey stations in relation to the access channel and disposal sites

Sea water was analysed *in situ* at the surface, mid-depth and above seabed, using a multiparameter probe measuring the following parameters: water temperature, salinity, turbidity, pH, dissolved oxygen and total dissolved solids. In addition, water samples were collected and analysed by Greenlab for:

- Total Nitrogen
- Total Phosphorus
- Phosphate
- Ammonium
- Nitrites
- Nitrates
- Suspended sediments
- Chlorophyll a
- *E. Coli*
- Intestinal *Enterococci*

The following guidelines are used to assess the sediment quality:

- UK Centre for Environment Fisheries & Aquaculture Science (CEFAS) Action Levels in Dredged Material Assessments⁷, and
- Canadian Sediment Quality Guideline for the Protection of Aquatic Life (CCME, 1999) .

The above guidelines are in accordance with the requirements in the OSPAR Guidelines for the Management of Dredged Material at Sea (OSPAR Commission , 2014).

CEFAS Action Levels are presented in Table 4-4. Contaminant levels in dredged material which are below Action Level 1 are of no concern. When contaminant levels are above Action Level 2 material is unsuitable for disposal at sea. When contaminant levels are between Action Level 1 and 2 dredged material requires further consideration and testing.

The **Canadian Sediment Quality Guidelines** involved the derivation of Interim marine Sediment Quality Guidelines (ISQGs) or Threshold Effect Levels (TEL) and Probable Effect Levels (PEL) from an extensive database containing direct measurements of toxicity of contaminated sediments to a range of aquatic organisms exposed in laboratory tests and under field conditions. These values were designed specifically for Canada and are based on the protection of pristine environments therefore the findings should be treated with caution. In the absence of suitable alternatives, however, it has become commonplace for these guidelines to be used by regulatory and statutory bodies around the world as part of a 'weight of evidence' approach in assessing the potential ecological effects of disturbed sediment.

Selected Canadian guidelines are comprised of two assessment levels. The lower level is referred to as the TEL and represents a concentration below which adverse biological effects are expected to occur only rarely (in some sensitive species for example). The higher level, the PEL, defines a concentration above which adverse effects may be expected in a wider range of organisms.

⁷ <https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans> accessed on 2 April 2019

Table 4-4 Action levels in mg.kg dry weight (ppm) for dredged material assessment defined by CEFAS

Contaminant/compound	Action Level 1	Action Level 2
Arsenic	20	100
Mercury	0.3	3
Cd	0.4	5
Cr	40	400
Cu	40	400
Ni	20	200
Pb	50	500
Zinc	130	800
Organotins; TBT, DBT, MBT	0.1	1
PCBS, sum of ICES 7	0.01	none
PCB's, sum of 25 congeners	0.02	0.2
*DDT	*0.001	

*levels were set in 1994

Table 4-5 List of interim marine sediment quality guidelines (ISQGs)/threshold effect levels (TELs), probable effect levels (PELs)(dry weights) and incidence (%) of adverse biological effects in concentration ranges defined by these values.

Substance	Units	ISQG/TEL	PEL
Metals			
Arsenic	mg.kg-1	7.24	41.6
Cadmium	mg.kg-1	0.7	4.2
Chromium	mg.kg-1	52.3	160
Copper	mg.kg-1	18.7	108
Lead	mg.kg-1	30.2	112
Mercury	mg.kg-1	0.13	0.7
Zinc	mg.kg-1	124	271
Polychlorinated biphenyl (PCB)			
PCBs: total PCBs	mg.kg-1	21.5	189
Polyaromatic hydrocarbons (PAH)			
Acenaphthene	µg.kg-1	6.71	88.9
Acenaphthylene	µg.kg-1	5.87	128
Anthracene	µg.kg-1	46.9	245
Benz(a)anthracene	µg.kg-1	74.8	693
Benzo(a)pyrene	µg.kg-1	88.8	763
Fluorene	µg.kg-1	21.2	144
2-Methylnaphthalene	µg.kg-1	20.2	201
Naphthalene	µg.kg-1	34.6	391
Phenanthrene	µg.kg-1	86.7	544

4.7.3 Results and discussion

The results of the above surveys undertaken in 2019 are discussed below. Results shown in blue have no threshold levels set, results shown in green mean that the values are below action level 1 or TEL levels., results shown in yellow mean that the value is above action level 1 or TEL but below action level 2 and PEL.

Sediment quality analysis

Table 4-6 and Table 4-7 describes the results of the chemical sediment analysis.

Table 4-6 Results chemical analysis sediment samples in mg kg⁻¹ (as compared against Cefas action levels)

Sample	Aluminium	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Arsenic	Tin	Mercury	TBT
ST1	739	<0,250	3,08	<2,00	<1,50	<2,25	<2,25	<2,25	<1,25	<0,090	<0.0025
ST2	19.5 10 ³	0,635	49,5	22,3	20,3	8,54	44,1	<2,25	1,27	0,222	<0.0025
ST3	1,54	<0,250	8,98	<2,00	1,86	<2,25	2,65	<2,25	<1,25	<0,090	<0.0025
ST4	1,24	<0,250	7,20	<2,00	1,52	<2,25	2,63	<2,25	<1,25	<0,090	<0.0025
ST5	1,21	<0,250	28,8	<2,00	11,4	<2,25	<2,25	<2,25	<1,25	<0,090	<0.0025
ST6	3,47	<0,250	10,8	<2,00	4,05	<2,25	6,34	<2,25	<1,25	<0,090	<0.0025
ST7	1,54	<0,250	37,7	<2,00	15,8	<2,25	2,71	<2,25	<1,25	<0,090	<0.0025
ST8	3,28	<0,250	10,9	<2,00	3,84	<2,25	6,88	<2,25	<1,25	<0,090	<0.0025
											<0.0025
ST9	9,83	0,635	10,3	<2,00	4,09	<2,25	7,57	<2,25	<1,25	<0,090	<0.0025
ST10	2,38	<0,250	11,0	<2,00	3,10	<2,25	4,60	<2,25	<1,25	<0,090	<0.0025
ST11	957	<0,250	7,84	<2,00	<1,50	<2,25	<2,25	<2,25	<1,25	<0,090	<0.0025
ST12	2,96	<0,250	12,0	<2,00	3,90	<2,25	5,80	<2,25	<1,25	<0,090	<0.0025
ST13	1,53	<0,250	9,04	<2,00	2,14	<2,25	2,55	<2,25	<1,25	<0,090	<0.0025
ST14	2,48	<0,250	9,70	<2,00	3,26	<2,25	4,60	<2,25	<1,25	<0,090	<0.0025
Level 1	n.a	0,4	40,00	40,0	20,0	50,0	124	20,0	n.a	0,3	0.1
Level 2	n.a	5,00	400,0	400,0	200,0	500,0	271	100,0	n.a	3,0	1

Table 4-7 Results analysis sediment PAH and PCBs (as compared against Canadian Guidelines)

Substance	ST 1	ST2	ST3	ST4	ST5	ST6	ST7	ST8	ST9	ST10	ST11	ST12	ST13	ST14	TEL	PEL
PCBs: total PCBs	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	21.5	189
Acenaphthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	6.71	88.9
Acenaphthylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	5.87	128
Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	46.9	245
Benz(a)anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	74.8	693
Benzo(a)pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	88.8	763
Fluorene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.2	144
2-Methylnaphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	20.2	201
Naphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	34.6	391
Phenanthrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	86.7	544

Based on the results from the bore holes taken for the 2010 ESIA, a layer of silt was identified in the upper layers of the sea surface. Since the upper 3 meters of sediment will be dredged an additional 2 vibrocore samples (MBH 1 and MBH 2) were taken on February 18, 2019 in the port basin (see Figure 4-12) and assessed for possible contamination. The results are presented in Table 4-8 and Table 4-9.



Figure 4-12 Location of vibrocore samples MBH 1 and MBH 2 inside the port basin

Table 4-8 Results chemical analysis of bore hole samples in mg kg⁻¹ (as compared against Cefas action levels)

Sample	Aluminium	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Arsenic	Tin	Mercury	TBT
MBH 1	1.43 10 ³	<0,250	3.53	<2,00	<1.50	>2.25	<2.25	<2.25	<1.25	<0.05	<0.0025
MBH 2	2.23 10 ³	<0,250	4.04	<2,00	1.87	<2.25	3.50	<2.25	<1.25	<0.05	<0.0025
Level 1	n.a	0,4	40,00	40,0	20,0	50,0	124	20,0	n.a	0,3	0.1
Level 2	n.a	5,00	400,0	400,0	200,0	500,0	271	100,0	n.a	3,0	1

Table 4-9 Results analysis sediment PAH and PCBs in µg/kgMS (as compared against Canadian Guidelines)

Substance	MBH 1	MBH 2	TEL	PEL
PCBs: total PCBs	<10	<10	21.5	189
Acenaphthene	<10	<10	6.71	88.9
Acenaphthylene	<10	<10	5.87	128
Anthracene	<10	<10	46.9	245
Benz(a)anthracene	<10	<10	74.8	693
Benzo(a)pyrene	<10	<10	88.8	763
Fluorene	<10	<10	21.2	144
2-Methylnaphthalene	<10	<10	20.2	201

Naphthalene	<10	<10	34.6	391
Phenanthrene	<10	<10	86.7	544

The sediment quality assessment shows that:

- None of the sediment samples exceed action level 2 or PEL levels;
- At station 2 the contaminant levels for Cadmium, Chromium and Nickel exceed action level 1 concentration;
- At station 9 cadmium levels slightly exceed action level 1 concentrations; and
- The results of the PAH and PCB analysis show that all levels were below detection limit.

The baseline investigation performed for dredging has not found any concentrations of the investigated parameters (metals and total petroleum hydrocarbons) to exceed the intervention values based on the CEFAS and Canadian sediment quality standards for dredging. At station 2 levels did slightly exceed action level 1 concentrations. However, the exceedance is very limited, thus it is not expected to have an adverse effect on the environment. The sediments are therefore considered suitable for disposal on sea bottom. The results are in line with the results from the 2010 ESIA. No intervention measures are considered to be necessary. It is expected that the sediment quality in the extended part of the access channel will have similar results as it is further from the port and thus further from possible sources of contamination.

Water quality analysis

The 2010 ESIA mentions that the pollution levels of the marine water near the port are low, however this is not substantiated with water quality measurements. Thus additional survey was done to assess the physical and chemical water quality.

A summary of the data is provided in Table 4-10. Information collected at the sites by the handheld monitor indicated conditions generally anticipated in a marine environment. The parameters were quite similar across all stations. Unlike the other stations the turbidity at station 2 is quite high (NTU 3) which concurs with the silty sediment found at this location.

Table 4-10 Summary of water quality physical parameters

	Unit	ST 1	ST 2	ST 3	ST 4	ST 5	ST6	ST7
pH		8.0	8.1	8.0	8.1	8.1	8.1	8.2
Conductivity at 25°C	µS/cm	54.3 10 ³ (Tm=18.0°C)	54.5 10 ³ (Tm=18.0°C)	54.1 10 ³ (Tm=18.0°C)	54.6 10 ³ (Tm=18.3°C)	54.3 10 ³ (Tm=17.4°C)	54.3 10 ³ (Tm=17.5°C)	52.3 10 ³ (Tm=21.5°C)
Total dissolved solids	mg/L	25.2 10 ³	27.1 10 ³	32.8 10 ³	27.7 10 ³	31.9 10 ³	31.7 10 ³	33.2 10 ³
Turbidity	NTU	0.57	3.0	0.27	0.16	0.10	<0,05	0,36
Dissolved oxygen	mg/L	7.93 at 18.2°C	8.02 at 17.7°C	7.98 at 17.7°C	8.19 at 17.4°C	7.93 at 17.8°C	8.37 at 17.0°C	8.55 at 16.5°C

	Unit	ST 8	ST 9	ST 10	ST 11	ST 12	ST13	ST14
pH		8.2	8.1	8.2	8.2 C	8.1 à 17.1°C	8.2 à 17.3°C	8.2 à 19.7°C
Conductivity at 25°C	µS/cm	50.5 10 ³ (Tm=18.0°C)	54.6 10 ³ (Tm=18.0°C)	54.5 10 ³ (Tm=17.9°C)	54.4 10 ³ (Tm=19.5°C)	54.6 10 ³ (Tm=18.0°C)	54.7 10 ³ (Tm=18.0°C)	54.5 10 ³ (Tm=18.0°C)

Total dissolved solids	mg/L	30.2 10 ³	29.1 10 ³	30.3 10 ³	29.2 10 ³	28.1 10 ³	30.0 10 ³	30.4 10 ³
Turbidity	NTU	1.1	<0.05	<0.05	0.14	0.18	1.0	1.4
Dissolved oxygen	mg/L	8.63 at 16.5°C	8.39 at 16.1°C	8.28 at 15.8°C	8.45 at 16.1°C	8.31 at 16.3°C	8.30 at 15.9°C	8.47 at 17.2°C

In addition, water samples were taken for nutrient analysis (as presented in the Marine survey report provided in **Appendix 4**). The results of the nutrient analysis show that there is a high concentration of nutrients (phosphate, nitrogen) and chlorophyll concentration in the area. This indicates that the area around the port is eutrophic. This is not unusual as the Mauritanian coastal zone is in an upwelling region which generally is characterized by high levels of nutrients and chlorophyll concentration during periods of upwelling.

4.8 Protected Area Designations

As mentioned in Section 4.5 a barrier system has been constructed to the south of the port. This has created a wetland area where several species of flora and avifauna were observed. It is however not considered as a protected area.

To the north of the port, sand dune systems are present providing natural coastal protection. These areas have been closed for human activities and driving on them is prohibited.

There are no protected areas near the port. The closest protected area is the National Park Banc d'Arguin, situated 150km North of the port. Figure 4-13 shows a sensitivity map, developed by the Ministry of Fisheries and Marine for the National Oil Spill Response Plan ('Plan POLMAR') (Ministère des Pêches et de l'Économie Maritime, 2016). This map shows several features in relation to environmental sensitivity, including sensitive and protected areas, areas of ocean upwelling, and cold water coral; none of which are close to Nouakchott.

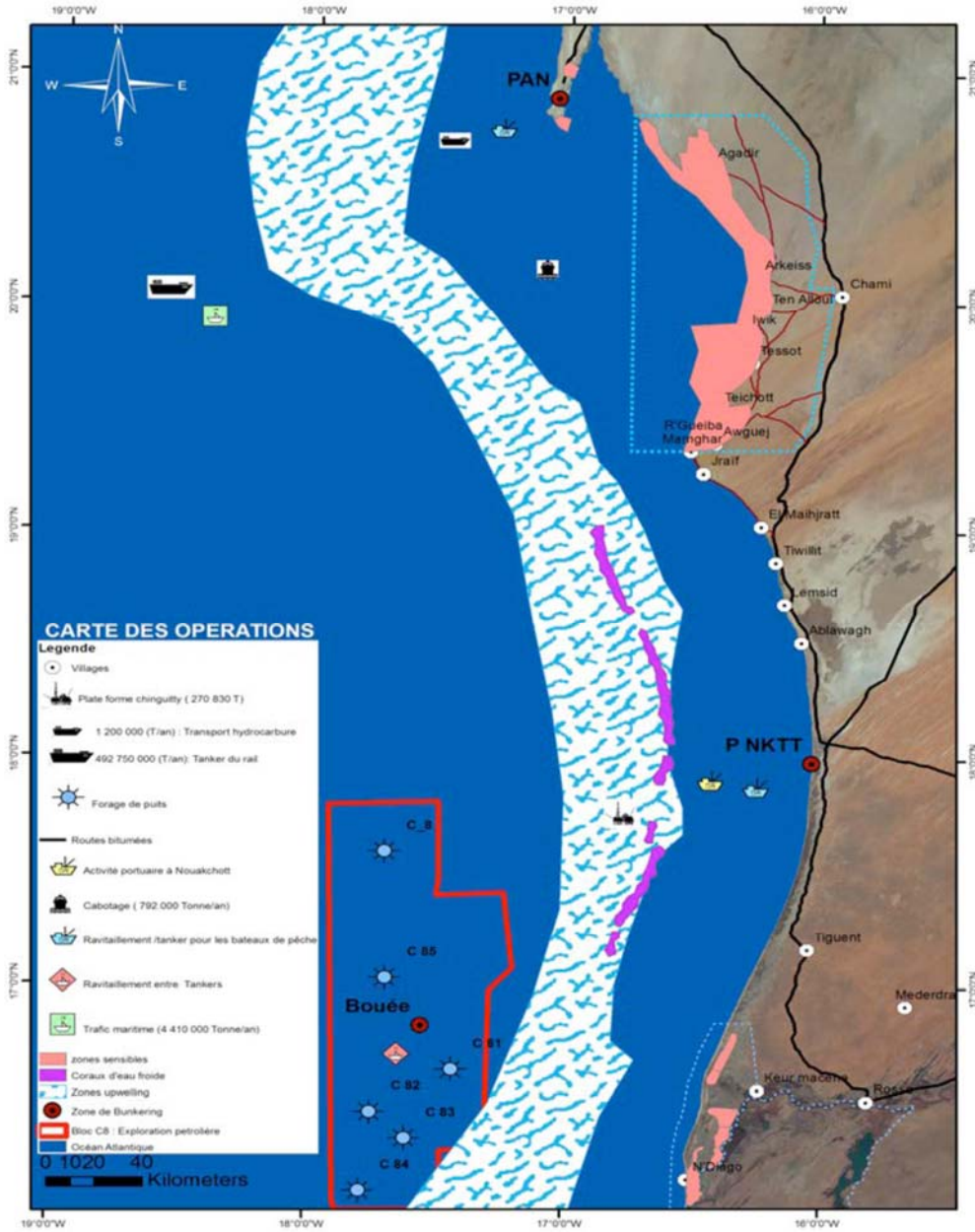


Figure 4-13: Map indicating areas of sensitivity (pink), cold water coral (purple), and ocean upwelling (white/blue) in reference to Nouakchott (P NKT) The area indicated with a blue dotted line indicates the National park Banc d'Arguin (Ministère des Pêches et de l'Économie Maritime, 2016)

4.9 Terrestrial Ecology

Within the port area, little terrestrial fauna was evident. Several individuals of sub-species of *Acanthodactylus* (fringe-fingered lizards or fringe-toed lizards) were observed along the route of the pipeline during soil sampling. Other independent studies have identified four sub-species that occur in the Project area, none of which are protected species (Tullow Oil, 2013). The *Acanthodactylus* is shown in Image 4-5.



Image 4-5: Unidentified sub-species of *Acanthodactylus* seen along the route of the pipeline

Several dogs were seen inside the Port; it is not known if these are feral or kept as guard/security dogs. Outside of the port, along the roads, several domesticated dogs, goats, donkeys, and camels were seen.

Evidence of deliberate planting was seen on the seaward side of the levee to the south of the port. This was documented in the 2010 EIA, and confirmed to be nursery mangrove planting, in order to provide more coastal stabilisation and protection.

Little evidence of flora or fauna was observed within the project work zone (including the right of way for the powerline).

4.10 Marine and Coastal Ecology

The Mauritanian marine zone is characterised by a high biological productivity caused by upwelling of cold and oxygen rich waters along the coast. Periods of upwelling occur during the period November to June. This encourages a high biodiversity and abundance of fishery resources. In the summer (July to October), when the wind changes direction, the Mauritanian sea is fed by warm surface waters coming from the South (Guinea current). A large part of the upwelling stops, except along the Cape Blanc where it persists all year. These different phenomena allow for a wide variety of species and ecosystems to occur along the coast of Mauritania (see Figure 4-15). The benthic community surrounding the port mostly consist of coarse sediment habitat with occasional areas of rocks (Figure 4-14).

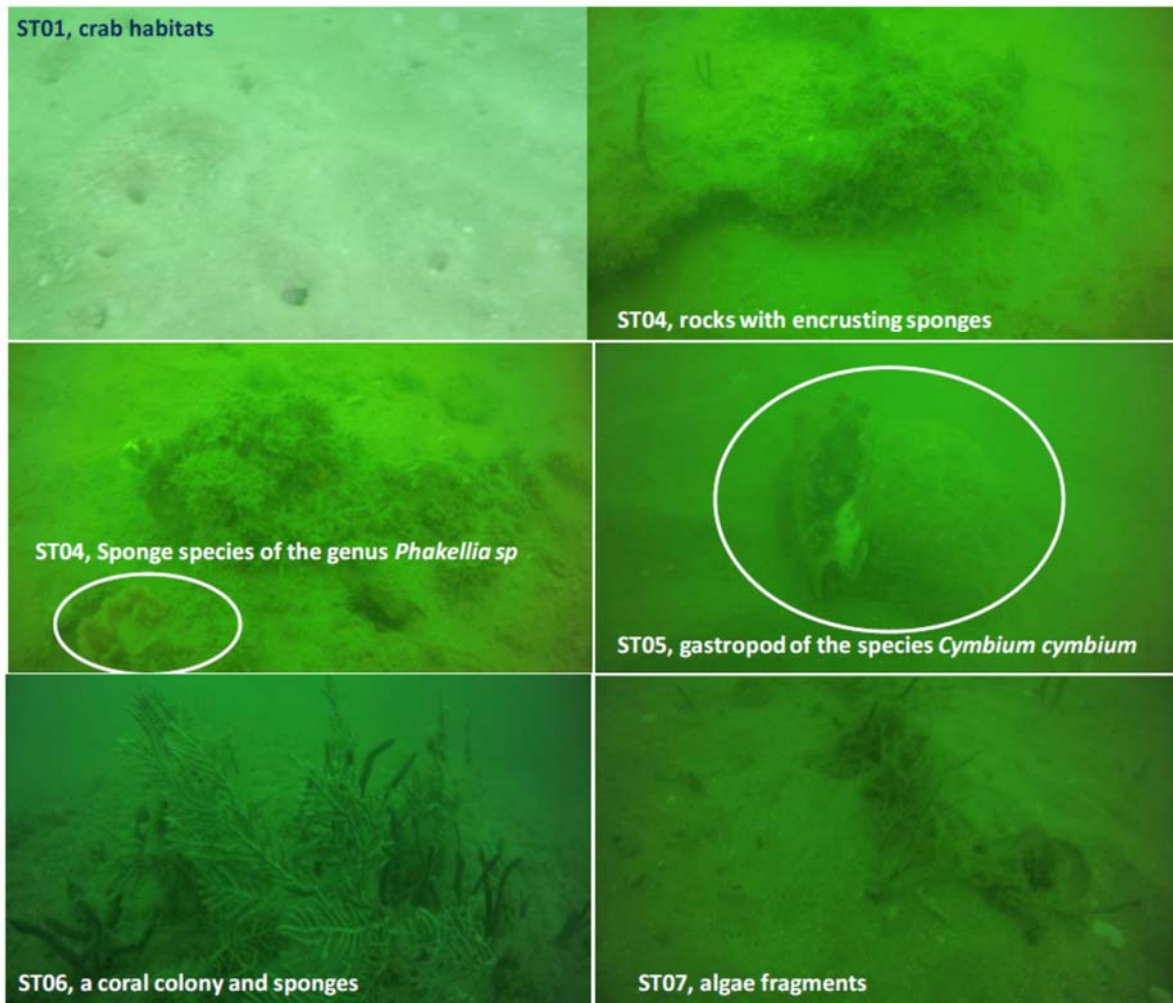


Figure 4-14: Pictures of benthic fauna communities taken during the marine survey showing presence of soft substrate habitat and hard substrate habitat with sponges and coral growth

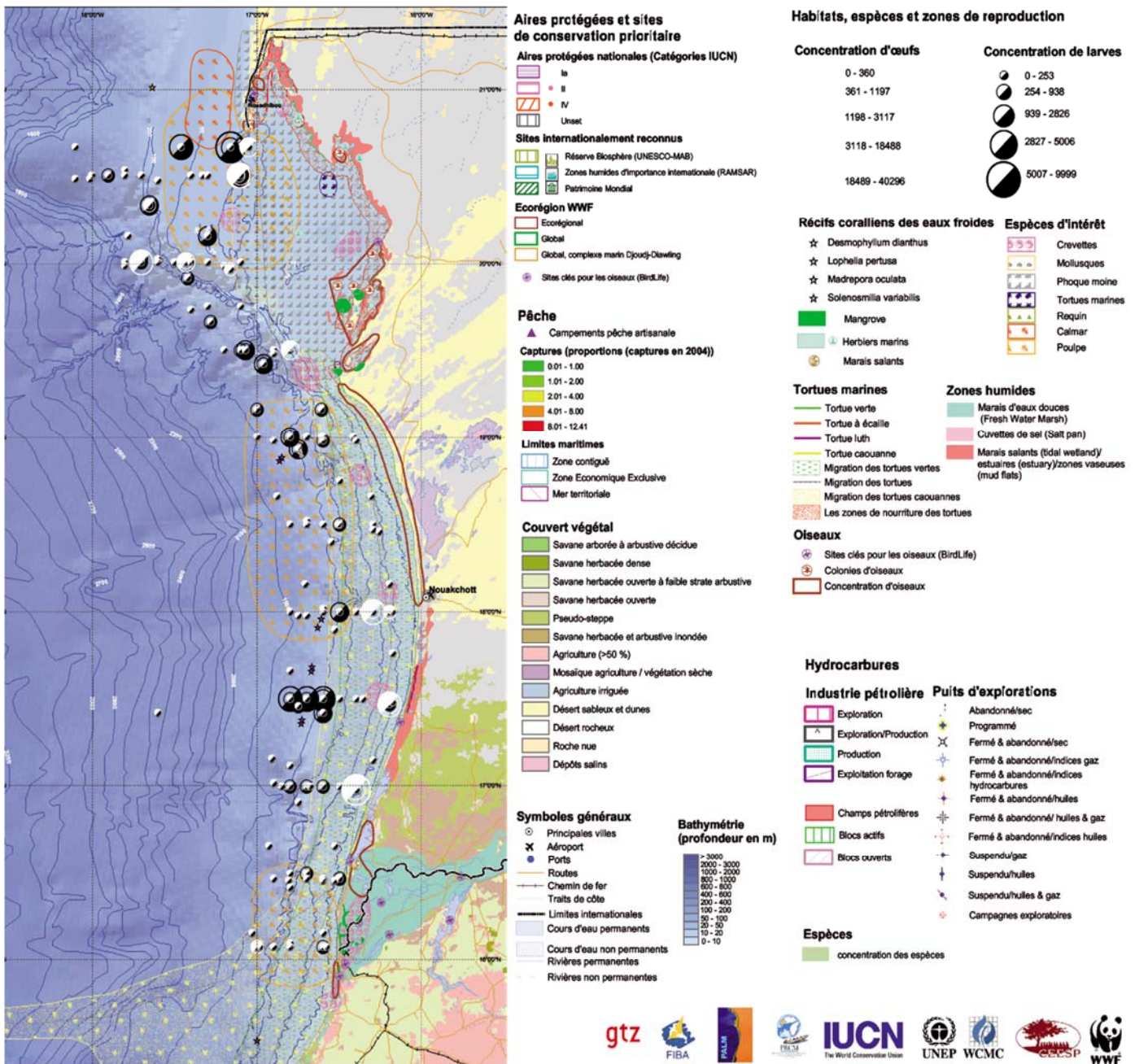


Figure 4-15: Probable location of species and habitats along the Coast of Mauritania (IMROP, 2013)

4.10.1 Avifauna

Several bird species (including sea birds) were identified during both site visits and are presented in Table 4-11. Previous independent studies indicate that several additional species, particularly sea birds, are likely to be found within the Project area; however, none of these are on the IUCN Red List, or have protected status.

Table 4-11: Bird species recorded during both the scoping visit and the baseline study

Name	English Name	Visit Seen	Protected	IUCN Status
<i>Pelecanus onocrotaius</i>	Great white pelican	Scoping visit	No	Least Concern
<i>Platalea alba</i>	African spoonbill	Scoping visit	No	Least Concern
<i>Phalacrocorax lucidus</i>	White-breasted cormorant	Scoping visit	No	Least Concern
<i>Xema sabini</i>	Sabine's gull	Baseline study	No	Least Concern
<i>Rissa tridactyla</i>	Black-legged kittiwake	Baseline study	No	Vulnerable
<i>Passer griseus</i>	Northern grey-headed sparrow	Baseline study	No	Least Concern
<i>Streptopelia senegalensis</i>	Laughing dove	Baseline study	No	Least Concern
<i>Morus bassanus</i>	Northern Gannet	Baseline study	No	Least Concern

The Banc d'Arguin National Park lies on the north west coast of Mauritania between Nouakchott and Nouadhibou. Its southern boundary is approximately 150km north of Nouakchott. The site is a major wintering and breeding site for migratory birds, with birds breeding on sand banks in the National Park. Though most migratory birds will concentrate in this region, the entire coastline of Mauritania is recognized as an important area for birds (see Figure 4-15). In addition, the area to the south of the port is a wetland which also provides interesting habitat for coastal birds. Offshore seabirds are concentrated around the continental slope. In the winter, large numbers of Northern Gannets (~40% of the world's population) European Storm-petrels (31.8%), and Grey Phalaropes (12.1%) will be concentrated in the upwelling (Camphuysen, van Spanje, Verdaat, Kloff, & Ould Mohamed El Moustapha, 2012).

4.10.2 Fish and other pelagic species

The sea in front of the West African coast is rich in fish (number and diversity). This is due to the upwelling currents in the area which bring high concentrations of nutrients and prey species. In total, more than 130 species of fish have been identified in Mauritania (Inros Lackner, 2010), of which only 35 live near the coast. The dominant species are *Serranidae* (sea bass), *Sparidae* (sea bream), *Pomadasyidae* (grunt) and *Scaiaenidae* (drum/croaker), as well as some species of flatfish and rays. Throughout the year there are schools of pelagic species, mostly *Sardinella* (sardines) and *Scombridae* (mackerel and small species of tuna). In addition to the fish species in the area, species of octopus and shrimp are found in the coastal region.

The cabot mullet (*Mugil cephalus*) can be found close to the beach along the Mauritanian coastline. However, since the movements of ships and boats in the harbour basin are constant, it can be assumed that fish fauna permanently occupying this area is minimal.

It is likely that fish species would use the wetland areas to the south, possibly as nursery and feeding areas.

4.10.3 Marine Mammals

The Peninsula of Cap Blanc, which lies on the north west coast of Mauritania near Nouadhibou, and the Banc d'Arguin National Park supports several marine mammal species including bottlenose dolphin (*Tursiops truncatus*), humpback dolphins (*Souza teuszii*), monk seal and the killer whale. The harbour porpoise (*Phocoena phocoena*), long finned pilot whale (*Globicephala melas*) and short finned pilot whale (*Globicephala macrorhynchus*) are occasional visitors in this area (IMROP, 2013). In addition, the upwelling zone further offshore is an important breeding area for the North Atlantic humpback whale during the winter (November – March). Other whale species such as sperm whale and the blue whale are known to feed in large numbers during the winter. In the summer, common dolphins, bottlenose dolphins and pilot whales are particularly abundant which correlates with the increase in sardines during this period (IMROP, 2013). The area of influence of the port development is generally too shallow for most of these species to occur except for the bottlenose dolphin. Most species will be found along the continental slope further offshore.

During the site visit it was mentioned that dolphins are sometimes seen near the port. Given the occurrence of marine mammals in the national parks, it can be assumed that a few individuals of similarly endangered species can be present in and around the port.

4.10.4 Turtles

Of the seven existing marine turtle species 6 have been observed along the coast of Mauritania. Of which the green turtle (*Chelonia mydas*) and the loggerhead turtle (*Caretta caretta*) are known to nest in Mauritania. These species have also been reported in the Bay du Lévrier, the bay between Cap Blanc peninsula and the North-West coast of Mauritania, and the Banc d'Arguin National Park, where there are large areas of seagrass beds, which provide a valuable feeding resource for these species. Sandy beaches provide important nesting area for turtles. For the green turtle, nesting has been recorded within the National Park to the North and further south between Nouakchott and Ndiago. Bycatch and stranding's of leatherback turtles have also been recorded in Mauritania. Occurrence of this species in Mauritanian coastal zone is mostly between March and May (IMROP, 2013).

Table 4-12: List of sea turtle species and their occurrence in Mauritania

Common name	Scientific name	Occurrence in Mauritania	IUCN status
Green turtle	<i>Chelonia mydas</i>	Adult and juveniles; feeding and nesting	Endangered
Hawksbill turtle	<i>Eretmochelys imbricata</i>	Juvenile, rare	Critically Endangered
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>	Adult rare	Vulnerable
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	Irregular, to be confirmed	Critically Endangered
Loggerhead turtle	<i>Caretta caretta</i>	Adult and juveniles; nesting	Endangered
Leatherback turtle	<i>Dermochelys coriacea</i>	Irregular, feeding and nesting to be confirmed	Vulnerable

No nesting areas have been identified near to the port. However, during the site visits, it was mentioned that turtles and dolphins have been seen near the port. A study conducted by (Hama, et al., 2018) on sea turtle nesting along the Mauritanian coast between June 2010 until October 2015 identified occasionally

high concentration of green sea turtle nest along the coast. In addition, they found one Loggerhead turtle nest in 2015. Suggesting that nesting of loggerhead turtles is very rare and sporadic. The majority of the nests were located on the beach between 28 and 65 km south of Nouakchott (Hama, et al., 2018). This is outside the project area of influence. The nesting season of the green turtle is between June and October. The nesting season of the loggerhead turtle is between late August and late December. It is possible that turtles, especially the green turtle, may be present transiting from nesting beaches south of Nouakchott to the seagrass areas within the National Parks to the north.

Even though, the Mauritanian government has ratified the CMS Memorandum of Understanding on Conservation Measures for Marine Turtles in the Atlantic Coast of Africa (MOU of Abidjan) in May 1999 and is involved in the Regional Conservation Program of the Marine and Coastal area of West Africa (PRCM), sea turtles and their nests are still being destroyed and poached along the entire Mauritanian coast. Additionally, sea turtle nests are easily exposed to numerous detrimental environmental conditions such as high (lethal) sand temperatures, substantial beach erosion caused by high sea tides and predation by African golden wolves (Hama, et al., 2018).

4.10.5 Benthic Fauna

To determine the benthic fauna species present within the project footprint 14 stations were positioned (see Figure 4-16 and Figure 4-17) and three replicate grab samples were collected from each sample station.

The grab samples were processed and analysed by local marine biologists from the *Institut Mauritanien des Recherches Océanographiques et de Pêche* (IMROP). In addition, photos were taken of the seabed at each station and videos were taken along a 200 meter transect at station 1,3,5,7,9,11 and 13. The detailed results of the analysis are presented in the Marine survey report ([Appendix 4](#)).

A total number of 19,111 individuals from 86 taxa were identified among the benthic macrofauna. The majority of the individuals were arthropods (45%) followed by annelids (31%) and then molluscs (13%). The highest density of benthic organisms (5200 indiv. per m²) and the highest biomass (836 g per m²) were observed at the stations in the access channel. The lowest biomass was observed in the port basin (144 g per m²). Also, the species richness was lowest at ST2 which is situated in the port basin (total 3 species identified). The greatest diversity of species was observed at Station 5 with a total of 34 species.

Based on the marine survey, the access channel and disposal sites are characterized as mostly soft sediment habitat with alternating areas of hard substrate (pebble) habitat. The soft sandy seafloor showed signs of presence of crab habitat at ST01, ST03, ST05 and ST07 and bivalve shell debris, such habitat is suitable for burrowing organisms.

The results from the video and photo analyses showed that at stations ST04, ST05, ST06 and ST11, rocky substrate species are present, such as encrusting algae, sponges and coral (See Table 4-13). Areas with rocky substrate tend to have a higher biodiversity and the species associated with it such as sponges and coral are generally more sensitive to disturbance. At ST11 sea urchins were observed on rocky outcrops. The extent of these rocky habitats in the project area of influence is unclear. In addition, the species of coral and sponges could not be classified based on photo and video footage alone as the camera had to be suspended above the seabed at a higher level to avoid damaging the epifauna and to reduce the likelihood of stirring up sediment.

The extent of the rocky substrate area is unclear. However, when comparing the bathymetry map with the marine survey results (Figure 4-17) it can be assumed that in the area where the depth is quite variable this could be due to harder substrate or rocks being present.

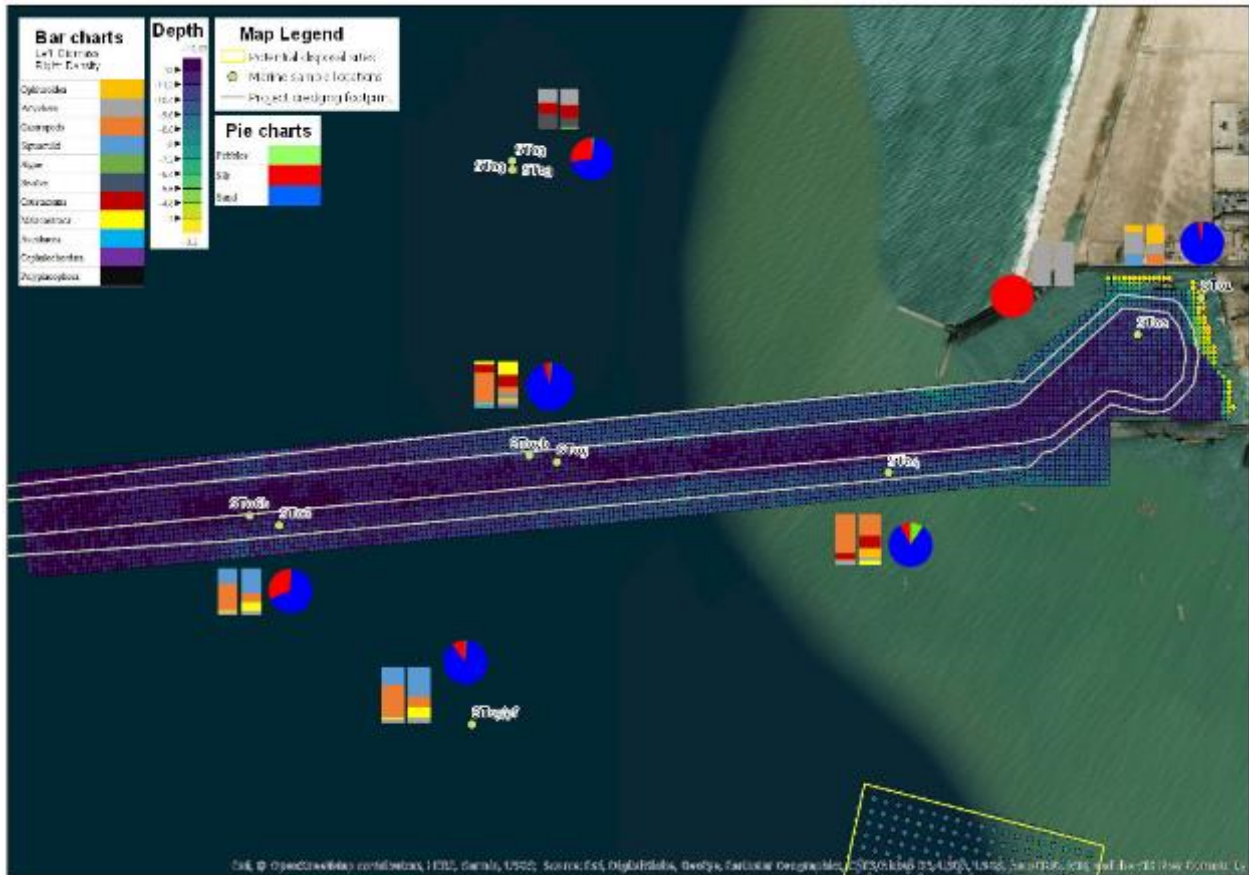


Figure 4-16: Map showing the combined results of the benthic fauna analysis, PSA analysis in relation to the bathymetry for each marine survey station in the access channel and reference areas.

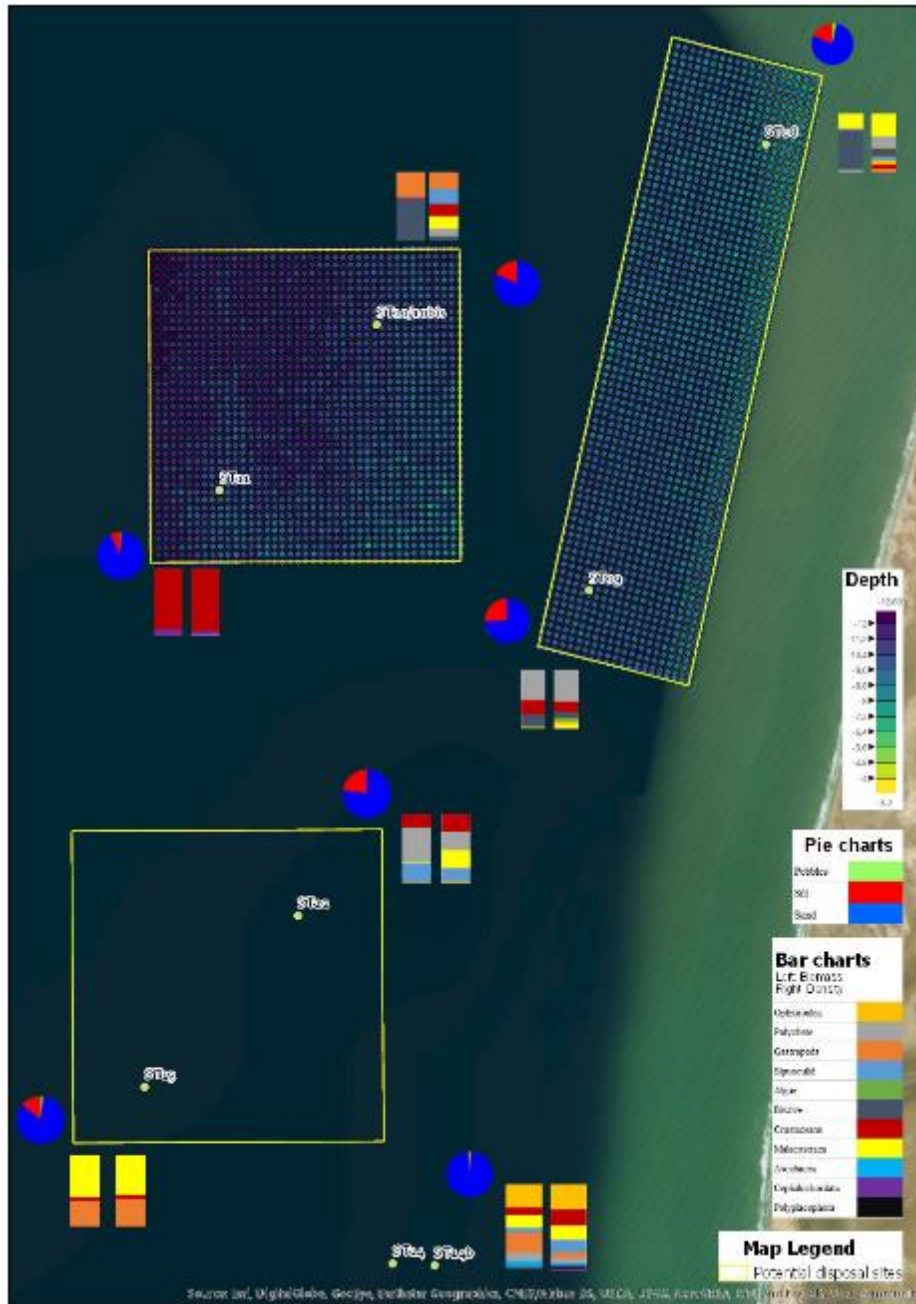


Figure 4-17: Map showing the combined results of the benthic fauna analysis, PSA analysis in relation to the bathymetry for each marine survey station in the potential disposal sites and reference areas.

Table 4-13: Results of photo and video analysis of epifauna at 14 stations according to the SACFOR scale.

Stations	Habitat types and sedimentary nature	Brown algae	Corals	Crabs	Echinoderms	Sponge	Bivalves	Gastropods	Bone fish
ST01	Soft sandy bottom + Habitats of organisms			Abundant			Occasional		
ST02	Not exploitable, visibilité trop faible								
ST03	Soft bottom Sandy + Shellfish Debris			Occasional			Occasional		
ST04	Soft bottom Sandy + rocks + Habitats of organisms	Occasional	Occasional			Abundant			
ST05	Soft bottom Sandy + rocks + habitats of burrowing organisms + Habitats of Bernard l'Hermite	Occasional		Occasional			Occasional	Rare	
ST06	Soft bottom Sandy + rocks + organisms in crusts and erect	Occasional	Occasional			Abundant			
ST07	Soft bottom Sandy + brown algae	Rare		Rare			Rare		
ST08	Not exploitable, visibility too low								
ST09	Not exploitable, visibility too low								
ST10	Not exploitable, visibility too low								
ST11	Rocks + sponge colonies				Occasional	Occasional			Abundant
ST12	Not exploitable, visibility too low								
ST13	Not exploitable, visibility too low								
ST14	Not exploitable, visibility too low								

Abundant	*****	Common	****	Frequente	***	Occasional	**	Rare	*
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4.10.6 Conclusion

The Mauritanian marine zone is characterised by a high biological productivity caused by upwelling of cold and oxygen rich waters along the coast. This encourages a high biodiversity and abundance of fishery resources. Within the port facility and immediate surroundings no mega fauna species (marine mammals and turtles) were identified during the site survey. However, there are possible migration routes of turtles in the area and also some dolphin species can occur in the shallow waters along the coast. Most cetaceans will be found in the Band d'Arguin area and further offshore.

The benthic survey identified rocky substrates with species of coral and sponges at 4 of the 14 stations of which ST 4, 5 and 6 are within the dredge footprint. The fourth station, ST11, is situated in the B disposal site. The extent of these rocky habitats and associated epifauna in the area is not clear.

4.11 Ecosystem Services

The four typical ecosystem services include: provisioning; supporting; regulating; and cultural. Apparent ecosystem services that were observed include provisioning and supporting services.

The sand dune system to the north (and further south) and the wetland area directly to the south or the port offer protection from coastal inundation and are therefore supporting services.

The area off the coast of Nouakchott is used heavily for commercial fishing, which takes place from designated beach launches along the coast, indicating a strong presence of a provisioning ecosystem. This however will be discussed separately in Section 4.14.4.

4.12 Visual Amenities

The port site is an existing established facility within a designated industrial zone. No new land is needed for construction, and all land and future worksites are vegetation free and considered brownfield sites.

The landscape of the industrial zone is flat, and all buildings stand out as noticeable features on the skyline. The Port - with several cranes, lights, and lighthouse - is visible on both roads leading to the main entrance. The skyline, looking south towards the Port about 4km away, is shown below.



Image 4-6: Skyline looking south towards the port; the cranes of the port can be seen on the skyline on the right-hand side, whilst local industry can be seen on the left.

4.13 Communities

4.13.1 Residential Areas

As previously mentioned, the area surrounding the port is a designated economic industrial zone, comprising of several industrial plants and factories. The city of Nouakchott is situated approximately 15km (centre) to the north east. Small semi-permanent informal settlement (shacks) is present some 5km to the north, as shown in Image 4-7, but no residential buildings were seen closer to the port.

During stakeholder meetings with the Wilaya, it was mentioned that this settlement is likely to be moved by the government to an alternative location, with more formal housing and better living conditions, and situated outside of the economic zone. Only the construction of the new underground power line (6 km) will have minor impacts on these residents associated with a temporary increase in noise and dust emissions. There will be no relocation associated with this work.



Image 4-7: Informal housing settlement, approximately 5km north of the Port

4.13.2 Port Employees

The 2010 EIA mentions that 300 professional dockers work at the port, as well as a casual workforce of around 5000 – 6000 workers. In addition to this, 320 permanent employees operate as support staff, including 25 women.

During stakeholder meetings with port operators and shipping companies, it was suggested that these figures are currently still reliable. A number of workers for each company interviewed during the stakeholder meetings is shown in Table 4-14. It is important to note that the information is not an exhaustive list of port employees but shows a large representation of employees and workers.

Table 4-14: Shipping Operators, Container Handlers, Dockers Associations and number of employees

Organisation	Number of employees (approximate)
APM Terminals	110
CMA-CGM	90
Securim SRMOP	2500 casual, plus support/full time staff

4.13.3 Fishing community

The nearest artisanal fishing community is approximately 25km to the south. Details are provided in section 4.14.4.

4.14 Economics and Livelihood

4.14.1 Port Autonome of Nouakchott Operations

The port land covers 14,000 hectares, a large part of which is available. The spaces are under lease for 15 to 20 years.

It has a total of 8 berths including the oil cargo berth as shown on Figure 3-5 (page 18) spread between the North quay and the South quay.

The oil cargo berth (also called 'oil jetty') can accommodate 10,000 dwt oil/gas tanker. The south quay can accommodate "third-generation container ships and tankers of 35,000 to 40,000 dwt" however, it is not connected to tanks and therefore cannot be used to supply hydrocarbons.

Container operations are now organised on two platforms (North platform: Posts 1 to 3) and (South platform: Posts 4 to 7). The containers are then transferred from/to "Off Docks" areas behind the quay by trucks working in a chain system. Each shipping company has partnerships with handlers who are also lessees of the different areas. MSC is at SMPM (Mauritanian Company), Grimaldi: SOGECO (Bolloré), CMA-CGM: OPM, Maersk: APMT

Hydrocarbon discharge operations are performed towards the inland oil cargo berth (9.5 m deep) and the storage tanks (74,000 m³) in the port area to the east of the dock. The facility cannot offer a "bunkering" berth. The hydrocarbons are handled and stored by the state-owned company SMHPM.

The other handling operations (bulk, conventional) are performed on the 2 quays North and South and mainly by on-board cranes. In this case the importer or shipping company hires stevedoring services (labour). There are no storage silos at the port of Nouakchott. The transfer to the bulk silos is performed by trucks working in a chain system.



Figure 4-18: Location of the different depots at the port of Nouakchott (Royal HaskoningDHV, April 2019)

4.14.2 Industrial Activities

Other industries located in the project area of influence include:

- An oil tank farm owned by the state-owned company SMHPM (Société mauritanienne des hydrocarbures et du patrimoine minier);
- Cement factories (including Ciment de Mauritanie SA, part of the ASML group with a production capacity of 900,000 tonnes/year); and
- A flour factory (Les Grands Moulins de Mauritanie, GMM).

4.14.3 Commercial Activities

Within the port facility, there is one commercial building, a petrol station, that offers 'fast food' as well as having a small convenience store, as shown in Image 4-8. It was noted during two stakeholder meetings that most if not all companies within the port provide staff with meals in exclusive canteens, which explains why few facilities exist inside the port.



Image 4-8: Petrol station within the port facility, offering fast food and a convenience store

Outside of the port, several street traders/hawkers were seen, selling food items and snacks such as bread to passing vehicles, vehicles waiting either to get inside the port, or taxi/bus drivers waiting for passengers. An example of this can be seen in Image 4-9.



Image 4-9: Street trader selling bread to drivers and passengers waiting in vehicles outside the main port entrance

4.14.4 Fishing

The waters off Nouakchott (and all of Mauritania) support significant numbers of fish species many of which are targeted by the artisanal and coastal fishing and industrial fleets. Most commercial species occur in coastal waters from close inshore to the edge of the continental shelf. Fish species that occur in

the shallow coastal habitat are also important as these areas act as vital nursery grounds and assist with sustaining fish stocks in coastal waters.

The artisanal fishing centre is situated approximately 12km to the north of the port, due west of the city centre (see Image 4-10); fishing grounds encompass both north and south of the port.



Image 4-10: Nouakchott artisanal fishing centre

Fishing access is strictly controlled in Mauritania, and there are no official designated fishing centres for several kilometres to the north and south of Nouakchott, apart from Nouakchott itself.

The coastal area is restricted to artisanal and coastal fisheries which generally fish at a maximum depth of 30m and distance of 6 nautical miles from shore. During stakeholder consultation with local fishing organisations, it was understood that artisanal fishing boats are defined as boats that are less than 12m in length, which consist of a crew of 4-8 people. Larger boats are used; up to 26m in length with crews of up to 30 men using purse seine nets, often assisted by smaller boats.

There are between 3000-5000 boats in Nouakchott, and approximately 800 Senegalese fishermen. The fishing industry in Mauritania employs over 100,000 people both directly and indirectly. Of this, 45% of the fishing industry is centred in Nouadhibou, and the remaining 55% along the coast of Mauritania.

Artisanal fishing targets coastal species such as the mullet, the croaker, bluefish, and bonga shad (*Ethmalosa fimbriata*), several shark and ray species. More recently this fleet has developed fishing capacity further offshore and has started to capture significantly more species of "small pelagics" such as sardines and horse mackerel. An increase in sardine's catches has been observed at the fishing port near Nouakchott (IMROP, 2013). The total fish caught and exported in 2017 and 2018 is given in Table 4-15.

Table 4-15 Quantity of fishery products exported by type of product and by port in 2017-2018, NDB: Nouadhibou and NKC: Nouakchott (source: info received from Marine Specialist at EnviroConseil Mauritanie)

Type of fish	2017		2018	
	Port NDB	Port NKC	Port NDB	Port NKC
Pelagic fish	16 585	4 393	44 371	9 327
Cephalopods	41 376	6 981	31 177	6 851
Others	171 825	41 106	215 365	39 478
Total in tonnes	229 786	52 480	290 913	55 656

A military exclusion zone is in place from 5km north of the port, to 28km to the south of the port. In this area shore-access by boat is prohibited.

Furthermore, there is a marine security zone, see Figure 4-19, around the port which prohibits small boats from entering the area (this is in line with IMO SOLAS chapter XI-2 (July 1, 2014) International Ship and Port Facility (ISPS) Code). A monetary fine is in place if any fishing boat breaches the security zone, including crossing the access channel; the fine ranges from approximately €250 - €4800. There are no clear demarcations of the security zone thus it is not always clear for the fisherman where they can and cannot pass.



Figure 4-19 : Marine security zone around the port (<http://webapp.navionics.com>)

4.14.5 Recreation and Tourism

No evidence of recreation and/or tourism activities in the study area were seen during the Scoping Survey. This was confirmed during the baseline site visit; leisure activities do take place on the beach, but north of Nouakchott, for example, running, picnic's etc. Approximately 35 km north of Nouakchott there is a popular beach restaurant with tented accommodation. As such, the project will not affect recreation or tourism activities.

4.15 Infrastructure

4.15.1 Health

Several healthcare facilities are located within Nouakchott city. Specifically, the healthcare facilities available in Nouakchott-Sud (including El Mina) are shown in Table 4-16 from the most recent Ministry of Health survey available, conducted in 2014 (Ministère de la santé, 2014).

Table 4-16: Health facilities for Nouakchott-Sud and El Mina (Ministère de la santé, 2014)

Health care facility / data	Nouakchott City	Nouakchott-Sud	El Mina	Nouakchott Sud (2019) ⁸	El Mina (2019) ⁹
Population	958 399	425 673	132 674	513 200	159 957
General hospitals	4	1	0	1	0
Specialised hospitals	5	0	0	-	-
Health centres	19	9	3	9	3
Health posts	32	9	4	8	4
Clinics	18	0	0	-	-
Dental practices	60	0	0	-	-
Medical practices	78	0	0	-	-
Pharmacies	597	0	0	-	-
Specialist doctors	252	0	0	-	-
Dental surgeons	34	0	0	-	-
Number of general practioners	122	12	3	-	-
Number of nurses	689	92	20	-	-
Number of midwives	270	41	16	-	-

Currently there is no health care facility in close proximity to the port, as confirmed during stakeholder engagement. However, a new community health centre is under construction adjacent to the port. This will serve both port workers and community members, as well as having two ambulances (as reported during stakeholder meetings).

⁸ The statistics in this column were given during a meeting with the Wilaya Regional Director of Health

⁹ The statistics in this column were given during a meeting with the Wilaya Regional Director of Health

4.15.2 Waste Management

According to Wilaya representatives, there is a municipal landfill located approximately 25km from the port. No further details are known about this, and additional information was requested but not provided. Furthermore, the Wilaya reported that there is also a municipal incinerator, capable of handling medical waste.

Several kilometres to the north, in the area between Nouakchott and the port, large amounts of waste are dumped, as shown in Image 4-11, but the source of this waste is unknown. It did appear as if some form of processing/separating was taking place, as well as open burning (low temperature).



Image 4-11: Waste and refuse openly dumped.

4.15.3 Roads

Two main roads give access to the port. The first one (hereafter referred to as ‘the coastal road’) is parallel to the shoreline and leads north towards Nouakchott and the northern part of the country. The second road (hereafter referred to as ‘the eastern road’) runs towards the east from the port and connecting to the N2 which provides access to the south of the country and to Nouakchott to the north.

The road conditions are good, and reportedly recently resurfaced with asphalt. During the baseline survey field visit, teams of surveyors were seen surveying the coastal road, and announcements were reported on national radio that the expansion of the road, from two lanes to four lanes of traffic, would take place in 2019. This was confirmed with by the Regional Director of New Projects/Infrastructure, during a meeting with the Wilaya of Noukachott Sud.

There is very little baseline information available regarding the infrastructure and traffic situation surrounding the port. Large volumes of traffic were observed on the roads serving the port (especially when a ship is docked), but no congestions were observed.

4.16 Cultural Heritage

No evidence of historic or cultural heritage was observed during the scoping and baseline survey, and the subject was not mentioned during stakeholder meetings. A small mosque is present adjacent to the main entrance of the port but is not to be affected by the Project activities.

5 Stakeholder Engagement and Public Consultation

In order to optimise the stakeholder engagement process a **Stakeholder Engagement Plan (SEP)** has been developed for the Project during the ESIA process. The SEP is provided in **Appendix 6** of this report.

5.1 Stakeholder Identification and Analysis

Key project stakeholders have been identified and analysed as presented in section 4 of the SEP. Stakeholder groups include:

- National authorities;
- Local authorities;
- Port employees (including shipping operators, container handlers, dockers associations);
- Local fishermen associations;
- Project proponent (head office, financial partners and employees);
- Industries located in the Project area of influence, and;
- NGOs.

5.2 Outcomes of Stakeholder Consultations

Table 5-1 of the SEP gives an overview of the consultation conducted during the ESIA process (National and International) including the concerns, expectations, apprehensions and comments made by stakeholders. Minutes of these meetings are also included in the Appendices of the SEP.



Figure 5-1: April 2019 consultation meeting

In general, stakeholder meetings have been well received. A summary of the relevant information pertaining to environmental and social concerns or impacts are noted below as categorised by key stakeholder group:

Port employees/operators:

- Concerns
 - Not dredging the full inside area of the Port; current plan could create internal current circulation and erosion;
 - Inadequacy of the breakwater;
 - High volumes of marine traffic and larger ships have a higher risk of oil spill and collision;
 - Increased air pollution and dust for employees health and safety;

- The siting of the oil jetty inside the harbour; a proposed alternative was for it to be located outside to reduce pollution inside the harbour; and
- Whether the effect of ocean swell had been considered in the design.
- Expectations
 - Use of the workers represented by the dockers association Securim SRMOP: unskilled workers during the construction or specialised workers (e.g. crane operators) during operation.
- Positives
 - Good for commercial competition;
 - Positive impact on growth and economy.

Local fishermen associations:

- Concerns
 - High volumes of marine traffic and larger ships have a higher risk of oil spill and collision;
 - Establishing visible markers of the boundaries of restricted shipping lanes and permitted crossing points.
- Positives
 - Positive impact on growth and economy.

Local authorities:

- Concerns
 - High volumes of marine traffic and larger ships have a higher risk of oil spill and collision;
 - Concerns on the effects to coastal erosion brought on by Project activities;
 - Concern over management of waste during construction and operation.
- Positives
 - Positive impact on growth and economy.

6 Impact Assessment and Mitigation Measures

This chapter provides an assessment of potential environmental and social impacts from the proposed Project as well as the proposed mitigation measures to avoid, reduce, remediate or compensate for potential negative impacts and to enhance positive impacts.

A description of the assessment methodology used to assess the significance of potential impacts, taking into account impact magnitude and sensitivity of receptors and resources affected, is provided below.

To facilitate the reading of the ESIA, the same heading structure in terms of environmental indicators, receptors or resources affected by the project activities were considered as the ones used in the baseline chapter and listed in section 4.1.1. The only difference is the addition of a section on Occupational Health and Safety.

All the mitigation measures identified in this chapter have been collated into the Environmental and Social Management Plan ('ESMP') presented in Chapter 7.

6.1 Impact Assessment Methodology

An impact is essentially any change to a resource or receptor brought about by the presence of the Project component or by the execution of a Project related activity.

In general, the assessment of impacts will proceed through an iterative process considering four key elements:

1. Prediction of potential impacts and their magnitude (i.e., the consequences of the development on the natural and social environment);
2. Evaluation of the importance (or significance) of potential impacts taking the sensitivity of the environmental resources or human receptors into account;
3. Development of mitigation measures to avoid, reduce or manage the potential impacts or enhancement measures to increase positive impacts; and
4. Assessment of residual significant impacts after the application of mitigation and enhancement measures.

Where significant residual impacts remain, further options for mitigation may be considered and impacts re-assessed until they are as low as reasonably practicable for the Project and would be deemed to be within acceptable levels.

6.1.1 Defining Impacts

Impacts will be defined in a number of ways, including:

- Nature of impact: positive or negative;
- Type of impact: direct, indirect, or cumulative;
- Duration of impact: temporary, short-term, national, international
- Scale of impact: onsite, local, regional, national, international.

6.1.2 Assessment of Significance

Criteria for assessing the significance of impacts will stem from the following key elements:

- Status of **compliance** with relevant Mauritanian legislation, policies and plans and any relevant Mauritanian or industry policies, standards or guidelines, as well as international best practice standards and guidelines;
- The **magnitude** (including nature, scale and duration) of the change to the natural or socio-economic environment (e.g. an increase in coastal erosion, or an increase in employment opportunities), expressed, wherever practicable, in quantitative terms. The magnitude of all impacts is viewed from the perspective of those affected by considering the likely perceived importance as understood through stakeholder engagement;
- The nature and **sensitivity** of the impact receptor (physical, biological, or human). Where the receptor is physical, the assessment considers the quality, sensitivity to change and importance of the receptor. For a human receptor, the sensitivity of the household, community or wider societal group is considered along with their ability to adapt to and manage the effects of the impact; and
- The **likelihood** (probability) that the identified impact will occur. This is estimated based upon experience or evidence that such an outcome has previously occurred.

It is generally accepted that significance is a function of the magnitude of the impact and the likelihood of the impact occurring.

For this assessment, significance has been defined based on five levels described in Box 6-1.

Box 6-1: Categories of Significance

Positive impacts provide resources or receptors, most often people, with positive benefits. It is noted that concepts of equity need to be considered in assessing the overall positive nature of some impacts such as economic benefits, or opportunities for employment.

Negligible impacts (or Insignificant impacts) are where a resource or receptor (including people) will not be affected in any way by a particular activity or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.

An impact of minor significance ('Minor impact') is one where an effect will be experienced, but the impact magnitude is sufficiently small (with or without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.

An impact of moderate significance ('Moderate impact') is one within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is ALARP (as-low-as-reasonably-possible). This does not necessarily mean that 'Moderate' impacts have to be reduced to 'Minor' impacts, but that moderate impacts are being managed effectively and efficiently.

An impact of major significance ('Major impact') is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of EIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones in coming to a decision on the Project.

For environmental impacts the significance criteria used in this ESIA is shown in Table 6-1.

Table 6-1: Overall Significance Criteria for Environmental Impacts

Receptor sensitivity (or resource value)	Impact magnitude		
	Low	Medium	High
Low	Minor	Minor	Medium
Medium	Minor	Medium	Major
High	Medium	Major	Major

For the social impact assessment, the perceptions of stakeholders, expressed as opinions around certain issues, can be as important as actual impacts. Consequently, the concept of perception is explicitly brought into the evaluation of significance after an impact is evaluated. When an impact is of significant stakeholder concern, this may be causing to raise the significance rating. This prompts the formulation of more rigorous and appropriate mitigation measures which focus on the source of the impact and also address stakeholder perceptions. The risk of not addressing stakeholder perceptions is that reputational damage could arise, resulting in the loss of a 'social licence to operate'.

Magnitude of Impact

The impact assessment describes what will happen by predicting the magnitude of impacts and quantifying these to the extent practical. The term 'magnitude' covers all the dimensions of the predicted impact to the natural and social environment including:

- the nature of the change (what resource or receptor is affected and how);
- the spatial extent of the area impacted, or proportion of the population or community affected;
- its temporal extent (i.e., duration, frequency, reversibility); and
- where relevant (accidental or unplanned events), the probability of the impact occurring.

For biophysical impacts, the definitions for the spatial and temporal dimension of the magnitude of impacts used in this assessment are provided in Box 6-1.

For social impacts, the magnitude considers the perspective of those affected by taking into account the likely perceived importance of the impact, the ability of people to manage and adapt to change and the extent to which a human receptor gains or loses access to, or control over, socio-economic resources resulting in a positive or negative effect on their well-being (a concept combining an individual's health, prosperity, their quality of life, and their satisfaction).

Sensitivity of Resources and Receptors

Sensitivities are defined as aspects of the natural or social environment which support and sustain people and nature. Once affected, their disruption could lead to a disturbance of the stability or the integrity of that environment.

For ecological impacts, sensitivity can be assigned as low, medium or high based on the conservation importance of habitats and species. For habitats, these are based on naturalness, extent, rarity, fragility, diversity and importance as a community resource.

For socio-economic impacts, the degree of sensitivity of a receptor is defined as ‘a stakeholder’s (or groups of stakeholders’) resilience or capacity to cope with sudden changes or economic shocks’. The sensitivity of a resource is based on its quality and value/importance, for example, by its local, regional, national or international designation, its importance to the local or wider community, or its economic value.

Likelihood

Terms used to define likelihood of occurrence of an impact are explained in Table 6-2.

Table 6-2: Explanation of Terms Used for Likelihood of Occurrence

An impact with a		
High probability	Refers to a very likely impact	Refers to very frequent impacts
Medium probability	Refers to a likely impact	Refers to occasional impacts
Low probability	Refers to a very unlikely impact	Refers to rare impacts
	As far as one-time events (e.g. air emissions) or slowly developing effects are concerned (e.g. impacts on local life style)	As far as possibly recurring impacts are concerned, such as accident or unplanned events (e.g. traffic accident, fire)

6.1.3 Definition of mitigation measures

Mitigation measures are developed to avoid, reduce, remedy or compensate for significant potential negative impacts, and to create or enhance potential positive impacts, such as environmental and social benefits. In this context, the term “mitigation measures” includes operational controls as well as management actions. These measures are often established through industry standards and may include:

- Changes to the design of the project during the design process (e.g., changing the development approach);
- Engineering controls and other physical measures applied (e.g., waste water treatment facilities);
- Operational plans and procedures (e.g., waste management plans); and
- The provision of like-for-like replacement, restoration or compensation.

For potential impacts that are assessed to be of **major** significance, a change in design is sometimes required to avoid or reduce the significance. For potential impacts assessed to be of **moderate** significance, specific mitigation measures such as engineering controls are often sufficient to reduce these impacts to ALARP (‘as-low-as-reasonably-possible’) levels. This approach takes into account the technical and financial feasibility of mitigation measures. Potential impacts assessed to be of **minor** significance are usually sufficiently managed through good industry practice, operational plans and procedures.

In developing mitigation measures, the first focus is on measures that will prevent or minimise potential impacts through the design and management of the Project rather than on reinstatement and compensation measures.

6.1.4 Assessing residual impacts

Impact prediction takes into account any mitigation, control and operational management measures that are part of the project design and project plan. A residual impact is the impact that is predicted to remain once mitigation measures have been designed into the intended activity. The residual impacts are described in terms of their significance in accordance with the categories identified in Table 6-1 above.

Social, economic and biophysical impacts are inherently and inextricably interconnected. Change in any of these domains will lead to changes in the other domains.

6.2 Air Quality and Climate

As all work will be performed within the existing port site area, construction and operation activities will likely have a small to insignificant decremental impact on the existing air quality. Moreover, given that the main city of Nouakchott is located approximately 15km to the north east of the port area and only few residential and commercial buildings are located along the main road (N2) to the south of the port and the nearest artisanal fishing community is approximately 25km to the south, there are few sensitive receptors to be affected by changes in air quality.

6.2.1 Construction phase

Impairment of air quality by exhaust emissions from vehicles, vessels and equipment engines

Fuel combustion in engines of vehicles, vessels and equipment's used during the construction activities will result in particulate matter (PM), nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO) and carbon dioxide (CO₂) emissions. It is noteworthy to mention that the quantity of emissions is dependent on the vehicle/vessel/equipment type, amount and condition (e.g. level of maintenance).

Except for dredging and material hauling, all activities will take place within the port area, the airshed of which is already degraded due to current port operations. Therefore, it is expected that the significance of the additional emissions brought by the project activities on the air quality will be low as they will represent a relatively small increase compared to the existing emissions. Further as mentioned above these emissions are only expected to affect the air quality within the port site.

In addition to their own exhaust emissions, trucks delivering material to the site will change the traffic volume and composition on haul roads, potentially resulting in local traffic congestion – and additional associated emissions – in urban areas along the routes to the port. However, this impact is expected to be limited in time.

Based on the above the impact is rated as **minor**.

Mitigation Measures

- Maintain and operate all vehicles, vessels and equipment engines in accordance with manufacturers recommendations;
- Select location of stationary generators to facilitate dispersion of the exhaust gases;
- Where available use as much as possible good quality (low sulphur) fuel;
- Develop and implement a Traffic Management Plan (TMP) for the hauling operations to minimise local traffic congestion as a result of truck movements.

With the implementation of the above measures the residual air quality impacts can be expected to be **minor**.

Dust emission from land preparation, concrete batching and material hauling

No land is needing to be cleared or stripped of vegetation and topsoil, so earthwork activities should be limited to just land preparation and levelling if needed. The mixing and production of concrete, and hauling and storage of sand, aggregate, and lime could result in increased dust levels during construction. This however, is likely to be of **minor** significance and consequence because of the relatively short

duration of the construction, the limited earthworks required on the site and the assumed level of ambient dust and particle matter already present in the area.

Mitigation Measures

- Cover loose materials and keep top layers moist;
- Stockpiled soil is not to be compacted but should be covered to limit wind exposure;
- Use binder material for erosion and dust control for long term exposed surfaces;
- Use dust suppression measures (e.g. wetting the ground) when necessary to reduce dust and erosion from wind;
- Regular cleaning of equipment, drains and roads to avoid excessive build-up of dirt;
- Use load covers for the transportation of materials that release dust emissions; and
- During dusty conditions use a speed limits on-site of 15 kph on unhardened roads and surfaces.

Post-mitigation significance is considered as **negligible**.

6.2.2 Operation phase

Impairment of air quality by exhaust emissions from vehicles, vessels and equipment engines

During operations, combustion exhaust emissions will result mainly from diesel engines used for the propulsion of vessels (both from Arise's own fleet and from shipping companies), and vessel-based auxiliary engines and boilers for power generation. In addition, combustion exhaust emissions will be generated from land-based activities involving the use of vehicles, cargo handling equipment (e.g., , forklifts) and other engines and boilers. As mentioned above, the quantity of emissions is dependent on the vehicle/vessel/equipment type, amount and condition.

Considering the life time of the operations (50 years) and the expected significant increase in traffic, the impact on air quality from exhaust emissions is rated as **moderate**.

Mitigation Measures

- Maintain and operate vehicles, own vessels and equipment engines in accordance with manufacturers recommendations;
- Where practicable in terms of technology and national policy, upgrade land vehicle and equipment fleets with low emission vehicles, including use of alternative energy sources and fuels/fuel mixtures (e.g. electricity or compressed natural gas, etc.); at this stage, Arise plans to procure major equipment (ship to shore container cranes (STS) and rubber tyred gantry (RTG) cranes) fully electrical;
- Encourage reduced engine idling during on- and off-loading activities;
- For vessel operated by Arise (if any), ensure combustion emissions (including NOx, SOx, and PM) are within the limits established by international regulations (MARPOL 73/78, Annex VI, Chapter III of MARPOL 73/78) and use low-sulphur fuels if available in Mauritania;
- Conduct a study to assess the feasibility for NCT to offer cold ironing (shore-based power) to vessels berthing at NCT;
- Discuss in a working group with Port Authority and other operators the possibility to use reduced ship propulsion power in port access areas, when practical and without affecting the safety of vessel navigation; and
- Explore ways to encourage the behaviour of shipping companies berthing at NCT towards a better environmental performance.

With the implementation of the above measures the residual air quality impact can be expected to be **minor**.

Volatile organic compound (VOC) emissions from fuel storage tanks and fuel transfer activities

Activities at the jetty's hydrocarbon terminal and during fuel transfer operations can result in volatile organic compound (VOC) emissions. The impact is rated as **moderate**.

Mitigation Measures

- Install vapor recovery systems¹⁰ for fuel storage, loading/offloading, and fuelling activities (see MARPOL 73/78, Annex VI, Regulation 15) ;
- Adopt management practices such as limiting or eliminating loading/unloading activities during poor air quality conditions;
- Implement fuel tank and piping leak detection and repair programs for on-site equipment.

With the implementation of the above measures the residual air quality impacts is expected to be **minor**.

6.3 Noise and Vibration

As most of the noise generating activities will be performed within the existing port site area, construction and operation activities will likely have a small to insignificant incremental impact on the existing noise levels. The main receptors will be project workers and neighbour port workers.

6.3.1 Construction phase

Nuisance noise from construction activities

Construction of the new quay in addition to the dredging operations can cause disturbance due to increased noise levels both in air and in water.

As terrestrial construction activities will take place inside the existing port footprint, and the piles for the new quay will be constructed *in situ* using a vibrohammer (not pile driven), impact of noise and vibration on human receptors is likely to be **minor** compared to current ambient noise levels and will only affect construction workers (see also section 6.15.1 on occupational health and safety and section 6.12.1 on community health).

Impact of increased terrestrial noise on avifauna receptors is discussed in section 6.9.1 (Impact on avifauna due to increased disturbance and noise, page 95).

Impact of increase of underwater noise levels on marine environmental receptors is discussed in section 6.9.1 (Impact on marine ecology due to increased underwater noise and vibrations, page 92).

Mitigation measures

In order to reduce noise from construction works as far as is reasonably practicable, it is recommended that generic best practices be employed such as:

¹⁰ See (IMO (1973) MARPOL 73/78 Annex VI Regulation 15 on VOCs, <http://www.imo.org/en/Publications/Pages/Home.aspx>; in addition to information at: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Air-Pollution.aspx> and IMO (1992) MSC/Circ.585 Standards for Vapor Control Systems, https://www.transportstyrelsen.se/globalassets/global/sjofart/dokument/imo_dokument/msc/msc_circ_585.pdf.

- Maintain and operate all vehicles and equipment's in accordance with manufacturer's recommendations;
- Avoid dropping materials from height, where practicable;
- Avoid metal-to-metal contact on equipment;
- Develop a noise control plan for relevant work practices and activities and discuss this with construction staff during health & safety briefings;
- Ensure periods of respite are provided in the case of unavoidable maximum noise level events and provide adequate Personal Protective Equipment (PPE) to workers;
- Impose vehicle speed limits for heavy goods vehicle traffic travelling on access roads close to receptors;
- Develop and implement a noise monitoring plan to measure out of door noise levels at relevant receptors (e.g. administration building, workers camp, etc.); if noise levels exceed WHO Guidelines for Community Noise (World Health Organisation, 1999) of 70 LAeq, implement temporary noise barriers or other appropriate noise reduction measures;
- Inform all potentially impacted port workers of project activities that have the potential to be with high noise level as well as providing the contact details of the community liaison officer.

6.3.2 Operation phase

Nuisance noise level from operation activities

Excessive noise may also result from typical port operations including cargo handling, vehicular traffic, and loading/unloading of containers and ships. As operation activities will take place inside the existing port footprint, impact of noise and vibration on human receptors is likely to be **minor** compared to current ambient noise levels.

Mitigation measures

See measures mentioned under construction phase. In addition, the following noise reduction measures should be considered in future investments:

- Replace as much as possible forklifts and reach-stackers with gantry cranes with rubber tires;
- Substitute where possible diesel engines with electric power.

6.4 Soil and Groundwater Quality

6.4.1 Construction phase

Soil and groundwater contamination from accidental spills of hazardous material and improper disposal of waste and wastewater

Pollution of soil is a risk primarily related to the spilling of fuel and/or liquid chemicals during transport, during storage, or during handling (transfer of one container to the other) or lubrication, refuelling, etc. Activities that have potential to cause such inadvertent releases include accidents involving vehicles or other machinery, leakage from storage containers (due to corrosion or other damage), and improper handling and storage. Pollution of soil and ground water is also possible if solid and or liquid waste is improperly disposed and leakage from such waste enters into the soil. Infiltration of sanitary waste may also lead to soil contamination.

Spilling of fuel or other liquid chemicals or percolation from dumped waste into soils result in long lasting damage to the functionality of the polluted soils as a resource and decrease habitat quality, primary

production and biodiversity. The effects are reversible, but only on a very long-time scale (decades or longer). The effect in soil is often of limited spatial extent.

This rating is very much dependant on the location of the release and the scale of the release. Given the low sensitivity of the surrounding areas and the medium magnitude of the potential consequences of an uncontrolled spill, the potential impact is rated as **moderate**.

Mitigation measure

The following mitigation measures will be implemented to protect soils against the potential contamination from inadvertent release of hazardous or contaminating material:

- Implement effective site drainage to direct surface water flow away from work/storage areas. This shall include cut-off drains to divert surface runoff from exposed soils or construction areas;
- Install oil water separators and grease traps at refuelling facilities, workshops, parking areas, fuel storage and maintain as appropriate;
- Bund areas where hazardous substances are stored (e.g., fuel storage area, waste storage areas);
- Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains and ensure it passes through the oil water separator prior to be released to the environment;
- Check and maintain regularly all plants and equipment to minimize the risk of fuel or lubricant leakages;
- Train relevant staff in safe storage and handling practices as well as on rapid spill response and clean-up techniques. Set-up and apply procedures regarding dealing with contaminated soils; and
- Develop and implement a Waste Management Plan for the Construction Phase to ensure that waste is collected and disposed of correctly. All waste materials must be properly segregated, and temporarily stored in a manner commensurate with the hazard posed by the waste and then disposed of in a proper waste facility that is appropriate to the waste type.

With the implementation of the above measures the residual soil and geology quality impacts can be expected to be **minor**.

Soil and groundwater contamination from oil jetty and hydrocarbon pipelines removal operation

The soil samples taken along the existing pipeline within the port found no signs of contamination. Therefore, with regards to removing the pipeline and exposure to contaminants in the soil, the risk is minor.

However, the pipeline itself poses a higher risk, due to its function for transporting hydrocarbons. Safe cleaning, dismantling, and removal of the pipeline is key to avoid potential significant contamination. The risk that is therefore associated with improper dismantling and removal of the pipeline is **moderate**.

Mitigation Measures

During the cleaning, dismantling, and removal of the hydrocarbon pipeline, the following mitigation measures will be adhered to:

- Residual fuel should be removed from all associated pipelines and managed as hazardous waste;
- All pipelines should be dismantled and/or capped-off and clearly labelled;

- If pipes are to be left *in-situ* (for example, subsurface sections), recommended closure methods should include cleaning and removing contents, inerting, and filling with sand and cement slurry, hydrophobic foams, or foamed concrete.

With the implementation of the above measures, the residual impact associated with the pipeline removal can be **minor**.

6.4.2 Operation phase

Soil and groundwater contamination from accidental spills of hazardous material and improper disposal of waste and wastewater

With the operation of the jetty's hydrocarbon terminal, large volumes of hydrocarbons will be transferred across the site through pipelines extending from the hydrocarbon berth to the junction point connecting the pipelines to the tank farm located outside the port. Fuel and other hazardous substances (e.g. paints, lubricants, etc. used in the maintenance workshops) will also be stored on site for port operations. Further, engine and hydraulic oil will also be used in most of vehicle and equipment operated on the work site (e.g. container trucks, contractors and suppliers). Risk of accidental spills from the above sources depends on the infrastructure (e.g. secondary containment) and management practices (e.g. maintenance) that will be put in place.

Wastes originating at the container and hydrocarbon terminal (and the rest of the port) may include inert solid waste from cargo packaging and from administrative offices, as well as hazardous or potentially hazardous waste associated with vehicle maintenance operations, such as paint, scrap metal, used lubricating oils and engine degreasing solvents. Waste originating from ships may include oil sludge, inert materials such as food packaging, and food waste. Risk for unmanaged waste generation depends on the waste management facilities that will be put in place as well as their handling capacity.

As for the construction phase, this impact is rated as **moderate**.

Mitigation Measures

- Install, maintain and monitor oil water separators and grease traps at refuelling facilities, workshops, parking areas, fuel storage and containment;
- Install secondary containment of areas where hazardous substances are stored (e.g. fuel, waste areas);
- Equip fuel dispensing equipment with "breakaway" hose connections that provide emergency shutdown of flow should the fuelling connection be broken by movement.
- Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques;
- Set-up and apply procedures regarding dealing with contaminated soils;
- Develop and implement a **Waste Management Plan** for the operation of the NCT.

With the implementation of the above measures the residual soil and land quality impacts can be expected to be **minor**.

Soil and groundwater contamination from accidental spills from hydrocarbon pipelines

Spills from the hydrocarbon pipelines can occur due to leaks, equipment failure, accidents, and human error or as a result of third-party interference. The pipelines under the responsibility of Arise are limited to the section within Arise's terminal premises (about 500m long from the berth to the junction point) and that

whole section of the pipelines will be placed in a concrete trench providing secondary containments in case of leaks. However, large volumes of hydrocarbons will transit through them during the 50 years operation of the terminal. Therefore impact is rated as **moderate**.

Mitigation Measures

- Conduct a spill risk assessment for the facilities and design, drilling, process, and utility systems to reduce the risk of major uncontained spills;
- Ensure adequate corrosion allowance for the lifetime of the facilities or installation of corrosion control and prevention systems in all pipelines;
- Install shutdown valves to allow early shutdown or isolation in the event of a spill;
- Develop automatic shutdown actions through an emergency shutdown system for significant spill scenarios so that the facility may be rapidly brought into a safe condition;
- Install secondary containment and leak detection systems at all hydrocarbon pipelines,
- Develop corrosion maintenance (e.g. regular pigging to clean the pipeline) and monitoring programs to ensure the integrity of pipelines;
- Ensure adequate personnel training in oil spill prevention, containment, and response;
- Ensure spill response and containment equipment is deployed or available for a response; and
- If the spill reached the marine environment, implement the Port Oil Spill Contingency Plan (see for more details Section 6.6.2).

With the implementation of the above measures the impact is expected to be **minor**.

6.5 Coastal Geomorphology, Coastal Processes and Sediment Transport

A potential effect of the construction is the release of suspended sediment and changes to the hydrodynamics and sediment transport patterns caused by dredging of the access channel and the disposal of the dredged material on the coastal environment. In addition, the potential extension of the breakwater on the North side of the port can have a potential impact on the coastal processes.

6.5.1 Construction phase

Impact on suspended sediment concentrations and sedimentation due to dredging and disposal activities

Dredging will take place in the port basin and the access channel. The potential effect of dredging on the local physical environment will be an increase in the local turbidity, changes to sand transport and sedimentation. The extent to which this is likely to occur can be determined by estimating the release of sediment into the water column during dredging operations and its subsequent dispersion by tidal currents and waves and eventual settlement. The levels of release of sediment is dependent on the sediment size, the hydrodynamic processes and on the dredging method and equipment that is applied.

Based on the marine survey (full results presented in **Appendix 4**), most of the sediment has a particle size between 2 and 0.063 mm. However, for some of the stations a large fraction of the samples did contain finer sediment with grain size < 0.063 mm (up to 44%). At station 2 a much higher proportion of finer sediments were identified.

In order to assess the potential impact of dredging and disposal activities, 2D and 3D modelling of sediment plume dispersion were conducted. Full results are presented in section 5.5 of the marine modelling studies (**Appendix 5** of this ESIA), The conclusions are summarised below.

- The dispersion of the sediment during dredging and disposal activities will differ depending on the season. During the winter, the turbidity plume is mainly directed to South of the dredging operation area and of the disposal areas, due to the ocean currents which mainly drive the plume in the winter. In contrast, in the summer period the sediment plume extends both to the North and to the South of the dredging and disposal areas.
- The plume from the dredging operations inside the port area will barely extend outside the port. Thus, impact from dredging inside the port will have a local effect on the turbidity levels within the port.
- The plume from the dredging operations along the channel and from disposal of the sediments shows that:
 - in the winter the 5 mg/L suspended sediment concentration (SSC) threshold is reached 4 km southward of the activities, on average. When considering the worst-case sediment dispersion scenario, the 50 mg/L SSC threshold is reached at 2 km south of the activities. And the sea bed thickness will increase by 5 mm in an area about 3.5 to 4 km south of the activities.
 - In the summer the 5 mg/L SSC threshold for the sediment plume is reached at 1 km in both northwards and southwards direction of the activities, on average. When considering the worst-case sediment dispersion scenario, the 50 mg/L SSC threshold is reached at 1 km north and south of the activities. The sea bed thickness will increase by 5 mm in an area of 2km north and south of the activities.
- As shown in the 3D modelling results, most of the sediments spill will be generated near the bottom, due to the dredging methods, and will then be spread around in the water.

Thus, during the dredging and disposal activities a worst-case increase of turbidity (based on a threshold of 5 mg/L) is expected 4 km to the south of the access channel and disposal sites. In addition, this area will be exposed to increased sedimentation. In the summer the impact area will be smaller than in the winter, however in the summer also the North side of the access channel will be impacted by de sediment plume.

It must be noted that the sediment plume modelling is based on several assumptions. Firstly, one of the assumptions are the spill rates of 3% during dredging and 10% during disposal. Considering the significant percentage of fines in the dredged sediment, the spill rates might be higher, in particular when overflow during dredging is applied. The spill rates also depend on the exact dredging equipment that will be selected. Secondly, the threshold SSC of 5 mg/L and threshold deposition of 5 mm seem to be arbitrary chosen. Indeed the threshold SSC should be compared with the baseline conditions. And for the deposition, the environmental effect of the deposition depends on the duration of the burial of flora and fauna, considering resuspension of deposits takes place with higher current velocities. Thirdly, waves are likely to reduce the deposition rate of the suspended sediment, resulting in thinner but longer deposits and larger suspended sediment plumes. It is proposed that the above assumptions are carefully confirmed in as part of the preparation of the Dredging Management Plan (DMP).

The dredging and disposal of dredged material will have a temporary, **moderate** effect on the suspended sediment concentration in the area of impact.

Mitigation measures

- Depending on the dredge method selected, management measures will be applied, such as:
 - Limiting the overflow during dredging activities (this will limit the overflow of fines and therefore reduce their dispersion);
 - Selection of appropriate dredge method (mechanical dredging will result in less suspended sediment at the disposal site) and rate of dredging (lower rates of dredging could reduce the plume density);
 - Changing dredging schedules based on tide, wind, waves and background/natural turbidity and or season to minimize effects due to increases in turbidity levels.

6.5.2 Operation phase

Impacts of project components on coastal processes during operation

The following project components built during the construction phase could have an impact on the coastal processes during the operation phase:

- Extension of the port with the construction of the main berth and container yard (reclamation);
- Extension of the existing south-western oriented breakwater located on the groin north of the port;
- Deepening of the port basin and access channel; and
- Deposition of dredged material at the disposal site(s).

Regarding the extension of the port, as the reclamation works will be within the existing port area, additional erosion and accretion in the nearshore area due to these works is expected to be limited.

Regarding the breakwater, considering its south-western direction, the impact of its extension on coastal processes is expected to be negligible. The alongshore sediment transport is already affected by the existing breakwater, and the effect of the extension is expected to be relatively small.

In order to assess the potential impact on the shoreline position caused by the deepening of the port basin and access channel and the dredge spoil deposition, modelling of the shoreline evolution south of the port was carried out. The model was run for a 10-year period (say 2019-2028), considering the 2019 initial shoreline position. The hindcast wave data were considered as input. For the project case, the computed near-shore waves and alongshore sediment transport are influenced by the bathymetry change. Full results are presented in section 6.3 of the marine modelling studies given in **Appendix 5** of this ESIA and conclusions are summarised below.

The modelling results of the shoreline evolution model are presented in Figure 6-1.

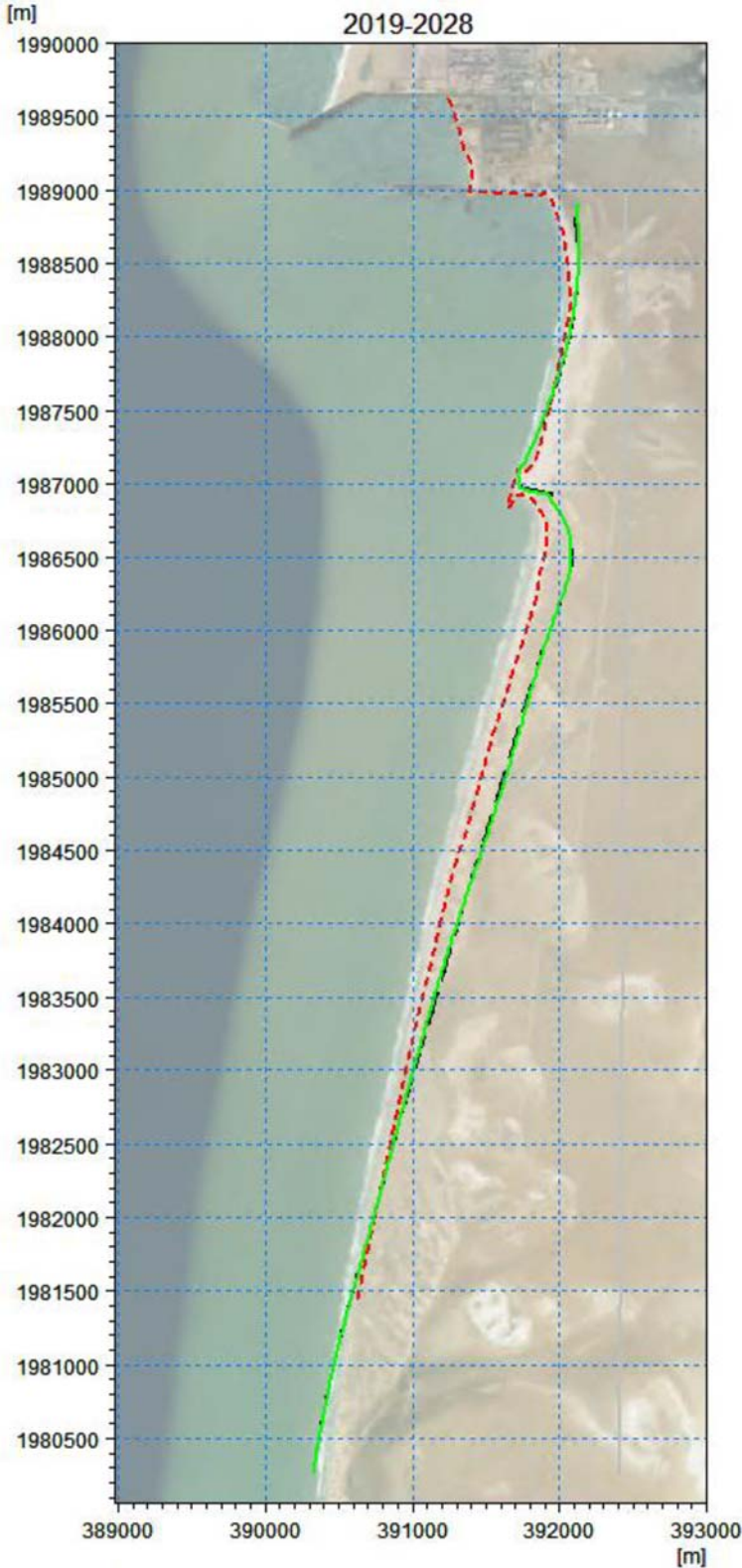


Figure 6-1: 10 year shoreline evolution simulation: comparison of shoreline evolution for the project case (green line) and the present case (dashed black) – initial position 2019 (dashed red)

As can be seen from this figure, in both cases with and without the port expansion, coastline erosion is predicted south of the breakwater located 2km south of the port, while the coastline erosion north of that breakwater is limited. The model predicts some coastline erosion between the port and the breakwater south of the port, but as the capacity of the model to represent properly the shadowing effect (especially the wave diffraction effect) is limited, the result for this specific area should be considered with caution. Also, the additional sedimentation in the deepened port basin and access channel are not taken into account in the model.

The coastline erosion south of the breakwater is about 150 to 200m (erosion rate of 15 to 20m/year), while, on average, the coastline between the port and the breakwater is relatively stable.

The shoreline position after 10 years indicates a maximum of -16m difference in alongshore position between the situation with and without port expansion. This indicates that the erosion in the project case, is increased by a maximum of 16m after 10 years (1.6m/year), compared to the present case. Further south (about 5350m of shoreline distance south from the port), the coastline erosion rate is reduced by about 1.4m/year compared to the present case. It can be noted that south of the breakwater (between 2000m to 2800m of shoreline distance south from the port), the coastline erosion rate is reduced by up to 0.5m/year.

In short, the deepening of the channel and port basins and disposal of dredge material will result in a potential increase of up to 8% (16m compared to 200m over 10 years period) of the existing coastline erosion rate. Based on the above results, the magnitude of the coastline erosion impact caused by deepening of the channel and port basins and associated disposal is considered **moderate**.

Mitigation measures

Though further analysis needs to be done to confirm the results of the marine modelling studies the following mitigation measures can be considered:

- Potential use of dredged materials to counter shoreline erosion through beach nourishment; this will be studied in the DMP as part of the selection of beneficial use of dredged material;
- Design, siting considerations and other coastal protection measures (e.g., beach nourishment, sand bypassing, groynes, seawalls, coastal revegetation, etc.) to minimize adverse impacts from the project on coastal erosion.

6.6 Marine Water and Sediment Quality

6.6.1 Construction phase

Impact of dredging on physical and chemical water quality parameters

In relation to dredging, impacts on water and sediment quality would be due to the creation of sediment plumes at the sea bed and depending on the methodology for dredging also at the sea surface (as the dredger overfills excess water which will include sediment in suspension or during the lifting of a mechanical dredge grab through the water column). It is expected that a TSHD will be used to dredge the channel. However, the exact dredging technique will be determined at a later stage as part of the dredge management plan. In addition, mobilisation of nutrients and/or contaminants during dredging is a potential source of impact, although the chemical analysis has not identified high levels of contaminants in the sediment.

Based on the marine survey, the sediment in the dredge footprint mostly consists of sand. In some areas, the sediment is mixed with mud/silt and in the port basin there are areas with high concentrations of silty sediment. The dredging of fine silts can give rise to generally larger sediment plumes. As the larger fraction of the sediment consist of coarse sandy material it is likely that the extent of the dredge plume will be limited. However, this will need to be confirmed by a detailed further sediment dispersion study that will be conducted as part of the development of the DMP.

The dredging activities will increase the turbidity levels within the area of influence. Silty fractions are more likely to impact on dissolved oxygen levels within the water column due to the generally higher organic content. Once dredging has commenced the physical parameters will return to background levels.

As described in section 6.5.1 the maximum extent of the sediment plume (based on a threshold SCC of 5mg/L) during dredging and disposal is expected to be approximately 4 km.

The dredging will have a temporary, **minor** effect on the physical water quality parameters.

Based on the marine survey the contaminant levels of the sediment are low thus risk of re-mobilising contaminant is **negligible**.

Mitigation measures

- Adapt the rate of removal of material, as slower dredging speeds may reduce impacts;
- Limit the speed of the cutter head to reduce the amount of material entering the water column;
- Change dredging schedules based on tide, wind, and background/natural turbidity to minimize effects due to increases in turbidity levels;
- Avoid “overflow” dredging by transporting the dredge to the disposal zone once the hopper is at capacity.

Impact of disposal on physical and chemical water quality parameters and disturbance of the seabed

In relation to disposal, impacts would be due to the creation of sediment plumes at the sea bed and also through the water column as a result of releasing the spoil at the disposal site.

Based on the marine survey, the sediment in the dredge footprint mostly consists of coarse sand. However, in some areas the sediment is mixed with mud/silt and in the port basin there are areas where silty sediment has accumulated. The disposal of fine silts can give rise to generally larger sediment plumes. As the larger fraction of the sediment consists of coarse sandy material it is likely that the extent of the sediment plume will be limited. As described in section 6.5.1 the maximum extent of the sediment plume (based on a threshold SCC of 5mg/L) during disposal is expected to be approximately 4 km from the disposal site.

The disposal will have a temporary, **minor** effect on the physical water quality parameters.

Additionally, as detailed above, levels of contamination within the sediments are generally low. Impacts on water and sediment quality are therefore considered to be **negligible**.

Mitigation measures

Implement the above mitigation measures as described in 6.6.1 on Impact of dredging on physical and chemical water quality parameters.

Increased levels of pollutants in marine water in case of discharge of untreated waste water

Several sources of effluent streams will potentially be generated during construction (e.g. sewerage water, washing water, stormwater). The risk of contamination from untreated effluent streams on the environment is therefore **moderate**.

Mitigation Measures

- Adopt treatment system design specifications for all effluents intended for discharge that allow compliance with specified discharge limits; as national limits don't exist, Indicative values for treated sanitary sewage discharges given in Table 1.3.1 of the IFC General EHS Guidelines (IFC, 2007) will be used as discharge limits to comply with;
- Sanitary/domestic wastewater collected in septic tanks shall be commingled with other sanitary wastewater streams and treated prior to discharge or pumped out and directed to an existing authorized treatment plant off-site.

If the mitigation measures are followed, the risk of contamination from untreated effluent will be **minor**.

6.6.2 Operation phase

Water contamination from an oil spill incident in or reaching marine water

Hazardous materials at ports typically include large volumes of hazardous cargo, as well as oil, fuels, solvents, lubricants and other hazardous substances used in port activities including vessel, vehicle, equipment and grounds maintenance. Spills may occur due to accidents (e.g., collisions, groundings, fires), equipment failure (e.g., pipelines, hoses, flanges), or improper operating procedures during cargo transfer or fuelling, and involve crude oils, refined products or residual fuels, liquid substances, and substances in packaged form. With the port extension, the number of vessels and size of the vessel are expected to increase which also increases the chance of an oil spill incident. In the event of an oil spill incident reaching marine water, its quality will be negatively affected. The water quality levels indicate low levels of pollution in the area. Thus, the risk of contamination due to an oil spill incident is **moderate**.

Mitigation Measures

- Adhere to the existing National Oil Spill Contingency Plan (Plan POLMAR) (Ministère des Pêches et de l'Économie Maritime, 2016) and the Port Oil Spill Contingency Plan (PIU) (PANPA, 2015);
- Update, together with the Port Authority the Port Oil Spill Contingency Plan to take into account any possible changes to risks or potential scales of impact as a result of the proposed port extension and ensure that equipment and trained staff are available for its implementation; the updated plan should amongst others:
 - Outline responsibilities for managing spills, releases, and other pollution incidents, including reporting and alerting mechanisms to ensure any spillage is reported promptly to the Port Authority;
 - Include provision of specialized oil spill response equipment (e.g., containment booms, recovery devices, and oil recovery or dispersant application vessels, etc.); and
 - Include regular training schedules and simulated spill incident and response exercises for response personnel in spill alert and reporting procedures, the deployment of spill control equipment, and the emergency care/treatment of people and animals impacted by the spill.

- Implement measures to prevent given in Section 6.4.2 to mitigate the risk of accidental spills on land of hazardous material (including oil from the hydrocarbon pipelines) and improper disposal of waste.

When following the above mitigation measures the impact of an incidental oil spill is reduced to **minor**.

Increased levels of pollutants in marine water in case of discharge of untreated waste water

Several sources of effluent streams will be generated during operations. Liquid effluents associated with land-based activities in ports and terminals (such as construction activities, vehicle maintenance and washing, fuel and material storage and transfer, etc.) include stormwater, wash water and sewage. Ship-generated effluents include sewage, ballast water (e.g. from oil tankers), bilge water, and vessel-cleaning wastewater. Wash water from land- and sea-based activities may contain oily residues. Ship sewage and wastewater contains high levels of BOD, total suspended solids, and coliform bacteria, and typically low pH levels (due to chlorination). Bilge water may contain elevated levels of BOD, COD, dissolved solids, oil, and other chemicals that accumulate as a result of routine operations.

The risk of contamination from untreated effluent streams on the environment is therefore **moderate**.

Mitigation Measures

- Implement the measures mentioned above (Section 6.6.1) to mitigate the impact of water pollution in case of discharge of untreated waste water from land-based activities; and
- Provision, in collaboration with the Port Authority and other port operators and shipping agent's collection, storage, and transfer and/or treatment services, and facilities of sufficient capacity and type for all wastewater generated by vessels at the terminal in accordance with MARPOL and national regulations.
 - Oily waste and wastewater should be collected in barges, vehicles, or central collection systems and storage tanks. The capacity of oily waste collection should be established based on applicable MARPOL provisions.
 - Sewage from ships should be collected and treated on-site or off-site according to the recommendations provided in the IFC General EHS Guidelines.

If the mitigation measures are followed, the risk of contamination from untreated effluent will be **minor**.

6.7 Protected Area Designations

6.7.1 Construction phase

As described in section 4.8, there are no environmental designations near the Project site, therefore the risk of any adverse impact on environmentally protected areas and species during construction and is considered **negligible**.

6.7.2 Operation phase

Though no environmental designations are near the project site the project can have a positive influence on the national park Banc d'Arguin. Currently, Hydrocarbon products first enter the port of Nouadhibou. The cargo is then transferred to smaller vessels which then go to the port of Nouakchott.

Hydrocarbon products will be imported directly to Nouakchott, instead of being first transhipped in Nouadhibou. With the new container terminal, vessels with hydrocarbon can directly sail to the port of

Nouakchott decreasing the disturbance of vessel in the national park. Therefore, the project has a minor **positive** impact on the protected areas in Mauritania.

6.8 Terrestrial Ecology

As described in section 4.9, the terrestrial part of the project is located within the existing port facility, and thus can be considered as an existing disturbed area with no significant vegetation. Therefore, the construction phase of the Project will not affect any significant habitat and the potential impact on terrestrial ecology is considered as **negligible**.

6.9 Marine and Coastal Ecology

6.9.1 Construction phase

Loss of habitat as a result of dredging

The dredging of the access channel would result in the loss of habitat in the immediate footprint of the dredging works. The access channel will need to be dredged to a maximum depth of 15.7 meters to allow the appropriate container vessels to enter the port. Approximately 5.2 million m³ of material will be dredged. The current proposed access channel is within the footprint of the current access channel which was dredged in 2014.

The benthic sampling revealed that in the access channel and the proposed disposal sites both soft and hard substrate habitat is present. In the areas with hard substrate, sensitive species such as sponges and coral were identified. The extent of this habitat is unclear. These species were mostly found on the edge of the access channel thus it is possible that these species were not affected during the dredging of the access channel in 2014. However, it is not known what the benthic community looked like prior to the dredging activities in 2014. The 2010 ESIA does not mention any presence of hard substrate species.

All samples that were taken in 2019 were within the existing channel. Whilst the area of the proposed extension of the channel was not sampled, it is anticipated that similar benthic habitat will also be present in this area and possibly even have a higher biodiversity as this area has not been disturbed by previous dredging activities.

The species present in the direct dredge footprint are unlikely to survive.

The sensitivity and the magnitude of the impact of the dredging works on the soft substrate species identified in the marine survey is expected to be low as they are likely to be more widespread in the area and generally would be able to rapidly recolonise and recover from dredging. In addition, there will be some disturbance to adjacent habitats. The impact on the hard substrate species is expected to be high as these species will most probably be sensitive to disturbance. The significance of the impact will be dependent on the overall distribution of these communities and the extent to which the dredging will affect the community, which is not known at present.

The sensitivity of the species cannot be specified because the coral and sponge species have not been classified and the overall distribution is not known. However, the area in which the disposal will take place is not a pristine environment. Knowing corals and sponges will be lost during dredging operations, the overall impact is predicted to be **moderate** adverse.

To re-evaluate this potential impact, it will be necessary to determine the extent of the hard substrate areas in relation to the area that will be impacted by the dredging and disposal activities (both direct and indirect). Additional benthic survey will need to be undertaken to identify the extent of the harder substrate community and the species present to provide further information on the sensitivity and determine the likely impact of dredging and disposal. In addition, this information is needed to develop an adequate Dredging Management Plan.

Mitigation Measures

Following the completion of the above survey work it will be possible to determine the significance of this potential impact and determine if mitigation is necessary and feasible.

Though the impact cannot be quantified good practice measures should be implemented according to international (IFC, EHS Guidelines for Ports, Harbours and Terminals, 2017) and national standards.

The following standard measures are proposed:

- Develop and implement a **Dredging Management Plan**. This plan should be tailored to the project and should:
 - define the dredging methodology;
 - identify and assess dredged materials disposal options and sites;
 - characterize the chemical and physical composition and behaviour of the sediments to be dredged;
 - characterize the environmental baseline where the port, harbour, and/or terminal (and disposal area) will be located;
 - define the area of influence with identification,
 - assessment and modelling of sensitive ecological receptors (usually through sediment plume propagation modelling); define mitigation measures to address adverse impacts (for example on aquatic habitat, biodiversity, and water quality), and relevant environmental monitoring parameters and indicators.

Loss of habitat due to disposal of dredge spoil

Three disposal sites have been identified as presented in Figure 3-4. Dredged spoil will be disposed primarily at disposal sites A and B. If required (to be determined during future dredging studies) disposal site C will be used. These disposal sites were also previously used during the dredging activities in 2014.

The placement of dredged material in the disposal sites will smother an area of habitat with associated communities. The marine survey identified area of rocky habitat in disposal site B, this habitat could possibly be more sensitive to disposal of spoil. In the other two disposals sites only soft substrate species were found.

The sensitivity of the species cannot be specified because the coral and sponge species have not been classified and the overall distribution is not known. However, the area in which the disposal will take place is not a pristine environment. Knowing that corals and sponges are sensitive to increase SSCs and deposition, the overall impact is predicted to be **moderate** adverse.

Mitigation Measures

As the samples have indicated the presence of hard substrate communities within disposal site B mitigation could be to use an alternative disposal site. However, more information is needed on the

sensitivity and distribution of the species to define appropriate measures for disposal. This will also be part of the DMP.

Impact of increased suspended sediment during dredging and disposal

As outlined in Section 6.5.1, the dredging works will result in an increase in suspended sediment concentrations in the port basin, access channel, disposal sites and adjacent areas. The majority of the sediment consist of coarse sand, however in some areas the sediment is mixed with a substantial mud fraction. The sand fraction is likely to settle out close to the dredging and disposal areas. It is generally the dredging of silts that give rise to larger sediment plumes that travel a greater distance. The increase in suspended sediment concentrations will also result in increased deposition in the localised area around the dredging and disposal. The increased turbidity and deposition in the area will put strain on the adjacent benthic communities and especially species that are sensitive to dredging related impacts such as corals, sponges and other filter feeders. These sensitive species were found in, or in close proximity to, the access channel and in disposal site B. The impact on these benthic communities will depend on the suspended sediment concentrations, the area affected and the rate and depth of deposition and duration of the impact. Also, the tolerance can vary between species. A recent study on the effects of dredging on sponges reveals that a scenario with high suspended sediment concentrations (76 mg/L, 0.1 mol photons m⁻²d⁻²) will cause increased mortality in phototrophic sponges and tissue regression in heterotrophic sponges (Pineda, et al., 2017).

The benthic community surrounding the port mostly consists of coarse sediment habitat with occasional areas of harder substrate. It is anticipated that the benthic communities within the area surrounding the access channel and disposal site which comprise soft substrate areas will be typical of any surrounding areas with similar sediment types. Therefore, the sensitivity of these species is regarded as low. However, the species inhabiting the harder substrate areas are more sensitive to sedimentation. The magnitude of the sediment plume and resulting deposition are unclear at this stage until further modelling work has been carried out. In addition, the sensitivity of the species cannot be specified because the coral and sponge species have not been classified and the overall distribution is not known. However, the area in which the dredging and disposal will take place is not a pristine environment. Knowing that corals and sponges are sensitive to increase SSCs and deposition, the overall impact is predicted to be **moderate** adverse.

To enable a more accurate assessment of the potential impact of increased turbidity and deposition as a result of dredging and disposal on the benthic community, benthic samples will need to be taken to identify the species present on the hard substrate. Furthermore, their overall distribution and distribution with respect to the dredging and disposal areas will have to be determined to provide further information on the sensitivity and evaluate the likely impact of dredging and disposal. In addition, these results will need to be compared to the results from the Marine Modelling Studies. This information is also needed to develop an adequate dredge management plan.

Mitigation Measures

As the samples have indicated the presence of hard substrate communities within disposal site B mitigation could be to use an alternative disposal site. However, more information is needed on the sensitivity and distribution of the species to define appropriate measures for disposal. This will also be part of the DMP.

Impact on marine ecology due to increased underwater noise and vibrations

Marine Mammals

Within the project area of influence marine mammals such as bottlenose dolphins can occur. Marine mammals can experience injury and/or change of behaviour resulting from noise and vibration generated during the dredging activities and are therefore likely to be disturbed if they are in the vicinity of the dredge works and the port. Typical sound levels emitted by Trailing Suction Hopper Dredgers are known to be generally in line with those expected for a cargo ship travelling at a modest speed¹¹. The sound levels have been measured during different projects using a TSHD such as the construction of Maasvlakte 2 and sand extraction off Sylt, Germany. The sound levels measured during these activities had a maximum estimated source level of 184 – 188 dB re 1 $\mu\text{Pa}^2\text{m}^2$ (with the main energy between 100 and 500Hz frequency) (World Organisation of Dredging Associations (WODA), 2013)

Very little research has been carried out on the effects of dredging on the behaviour of marine mammals. According to research conducted by Southall et al. 2007, underwater noise from dredging activities may affect primarily low frequency cetacean. These species are not expected in the vicinity of the dredge works. Southall et al. 2007 developed suggestions for marine mammals and the findings relate that it is very unlikely that underwater sound from dredging operations can cause injury. Temporary loss of normal hearing capabilities might happen if individuals are in the immediate vicinity of a dredger and are exposed for a long time, which is unlikely.

This area is already used as a port area and is therefore going to have an ambient level of underwater noise as vessels manoeuvre into and out of the port area. Overall, underwater noise generated by the dredger in the port and access channel is not anticipated to have a significant effect on marine mammals. The dredging activity is not expected to be above the background noise from existing shipping activities.

In addition, the construction of the new quay in the port can cause elevated levels of underwater noise. The construction works are not expected to include the use of impact piling. Instead vibration piling is used, where piles are shaken into place with a vibratory hammer. In general, it is assumed that noise levels from vibratory hammers are lower than impact piling. However, data on comparative responses of cetaceans to these different noise sources are limited. Graham et al. (2017) did conduct such a comparative study on the response bottlenose dolphins and harbour porpoises during harbour construction in North Scotland. Because of lack of other literature this study was used to give an indication of the level of impact that can be expected during the construction of this project. The results of the study show that there are responses in cetacean behaviour and distribution during harbour construction using vibration piling. However, both cetaceans were not completely excluded from the site. In addition, this study also gives an indication of the noise levels that can be expected during vibration piling compared to impact piling. . During this study the single-pulse sound exposure level [SEL] 198 dB re 1 $\text{IPa}^2 \text{ s}$, and the r.m.s. source level for vibration piling was 192 dB re 1 IPa . Predicted received broadband SEL values 812 m from the piling site were markedly lower due to high propagation loss: 133.4 dB re 1 $\text{IPa}^2 \text{ s}$ (impact) and 128.9 dB re 1 $\text{IPa}^2 \text{ s}$ (vibration).

Noise modelling has not been conducted for the port construction thus the exact noise levels and noise propagation is unknown. However, it can be assumed that during the construction the underwater noise levels in the port and in the immediate surroundings will be elevated. The noise levels of vibration piling are lower than that of impact piling, nevertheless marine mammals that are in the vicinity of the port will most probably avoid the area during construction. If the noise levels are similar to the noise levels measured at the harbour in Scotland the noise levels that caused disturbance will be limited to a 1 km radius around the port. As the project area of influence is not known to be a particularly well used or important area for marine mammals and the area that will be disturbed is small compared to habitat available for these species the impact from underwater noise on marine mammals is expected to be **minor**.

¹¹ http://www.dredging.org/documents/ceda/downloads/2011-11_ceda_positionpaper_underwatersound.pdf

Turtles

There is currently limited information available on the impact of underwater noise on marine turtles. Turtles can hear between 100Hz and 1kHz. This is within the frequency band at which levels of underwater sound from dredging are highest. Green turtles are most sensitive to frequencies around 300 Hz (Yudhana, 2011). De Ruiter & Doukara (2012) found for loggerhead turtles a shift in behaviour in response to sound. The turtles were interrupted while they were basking and started a dive response. This behaviour was mostly observed at close ranges and with a high exposure level (around 191 dB re 1µPa at 130 m and 175 dB at 839 m). The dive reaction of the turtles could have a negative impact on their fitness, because it can interfere with the thermoregulation (De Ruiter & Doukara, 2012).

The project area of influence is not an important breeding or feeding ground for turtles. However, turtles can be presented transiting from feeding grounds in the South to feeding grounds in the North. Therefore, the impact of increased underwater noise on marine turtles is expected to be **minor**.

Benthic Fauna

The proposed dredging works and construction of a new quay have the potential to result in underwater noise and vibration which may impact on the benthic community. Within the port, and surrounding area where vessels are manoeuvring, the background noise levels will already be relatively high with species adapted to this level of noise. In addition, impacts to the benthic community are likely to be localised to the area around the works and short-term in duration. The benthic community in the project area of influence is not considered to be particularly sensitive to noise and vibration and is, therefore, considered to have a very low sensitivity.

Within the port the background noise levels will already be relatively high. In addition, no impact piling works are planned as part of the proposed development and therefore the magnitude of the impact is considered to be low.

Overall the impact of noise and vibration on marine benthic invertebrates as a result of the proposed construction works is considered to be **negligible**.

Mitigations measures

Good practice measures when marine mammals or marine turtles are in proximity to a dredge or piling site to avoid impacts from noise and vibration is to have a marine mammal observer present during the activity to ensure that there are no obvious sightings in the surrounding area when activities commence. Observations for no less than 30 minutes should be undertaken prior to commencement. If marine mammals or turtles come into the area whilst works are underway then it is considered that they are not adversely affected. In addition, a soft-start/slow ramp-up should be used during pile driving and dredging activities to allow time for sensitive aquatic species to vacate the area.

Increased traffic and use of dredge vessels (collisions and entrapment)

Marine Mammals

Marine mammals such as dolphins can potentially occur near the port of Nouakchott. However, limited numbers of individuals have been sighted in this area. It is anticipated that the presence of marine mammals in proximity to Port Nouakchott is limited due to the levels of existing activity and disturbance. In addition, most species are found further offshore or in the National Park to the North. Although vessel numbers may increase during the construction period it is expected that these vessels will be slow moving

and stationary for the majority of the time. Potential impacts on marine mammals from physical injury or death caused by vessel collision is therefore unlikely during the project.

Therefore, a **negligible**, short term, adverse impact is expected as a result of the increase traffic.

Turtles

Turtles can potentially occur in the area near the port when transiting from feeding grounds to the south of the port to feeding/nesting grounds in the North. However, the number of turtles near the vicinity of the port is expected to be low. The potential impact on turtles from physical injury (e.g propeller wound) due to collision/accident with a marine vessel used for dredging should be considered. The risk to marine turtles from vessels depends on the vessels type, speed and water depth. This risk increases in shallow water. Vessel strikes during the construction and dredging activities associated with Port Nouakchott are considered more likely to occur to marine turtles due to higher vessel traffic (e.g. construction barge, material transport vessels and dredger). However, a limited number of vessels will be mobilised during the project and should not significantly increase the existing risk of vessel strike.

A **minor**, short-term adverse impact is expected as result of physical injury due to vessel strike.

Mitigation Measures

- When using a suction dredger only start the pumps once the draghead is close to the seabed and have a tickler chains or turtle deflectors on the drag head to reduce the likelihood of a turtle getting drawn into the draghead. This measure will be included in the DMP.

If the mitigation measures are followed, the risk of collision and entrapment of marine species is reduced to **negligible**.

Impact of suspended sediments on fishing success of sea and coastal bird species

As described in 4.10.1 few sea and coastal birds species can be present in the project area of influence. The increase in suspended sediments (turbidity) in coastal waters resulting from the dredging and disposal activity may affect the ability of marine species to locate and catch prey. However, sediment suspension is anticipated to be localised and temporary and birds present in the construction area are expected to be able to relocate to alternative coastal feeding grounds.

Therefore, sediment suspension is anticipated to have a **negligible** impact on birds.

Mitigation Measures

None required

Impact on avifauna due to increased disturbance and noise

The activities and the noise produced from the construction and dredging has the potential to disturb bird species feeding or resting in the area.

Bird species recorded in the study area during both site visits in November 2018 and January 2019 are not considered to be vulnerable. Bird species which are present are expected to be able to move to occupy coastal areas away from the construction and dredging activities. Therefore, the construction works are anticipated to have a temporary, **minor** adverse impact on birds through disturbance and displacement

Mitigation measures

See mitigation measures described in Section 6.3.1.

6.9.2 Operation phase

Impact of maintenance dredging and disposal on marine species

At the moment, it is unclear how often maintenance dredging will be needed to keep Port Nouakchott and the access channel at the required navigable depth. Currently, no maintenance dredging seems to take place.

The frequency of dredging will influence the significance of the impact as recovery will begin to occur almost immediately after dredging has completed. However, the communities that inhabit the disturbed area are likely to be opportunistic species, at least in the initial period following dredging. As such they can recover from subsequent disturbance relatively quickly. Should the periods between maintenance increase the significance of the impact is likely to increase as a more stable community will have developed. The frequency of maintenance dredging will also influence the potential for impact from smothering from the dredge plumes. The maintenance material is likely to consist mostly of fine material that has mobilised into the channel and thus the plume is likely to be widespread but less dense than if it were coarser material (as it will have dispersed quicker). Lastly the quantities of material to be dredged will be much lower than the quantities dredged during the construction phase.

If maintenance dredging is needed the impact on the benthic community due to dredging is expected be **minor** based on the information available at this stage. This is because the area will already have been dredged to reach the initial dredge depth and the disposal area already used for placement of dredged material and therefore the area is already impacted.

Mitigation Measures

See Section 6.9.1 where measures associated with impact of capital dredging works are described.

Increased use of the area by vessels using the new port increasing the risk of collisions with marine mammals and marine turtles

As explained in section 3.5.2 describing the traffic forecasts during the operation phase of the project, a significant higher number of vessels coming to and leaving from the port during the operation phase of the Project compared to the current situation is expected.

It is anticipated that the presence of marine mammals and turtles in proximity to the port is limited due to the levels of existing activity and disturbance and because the area is not of specific importance to these species. The vessel numbers will increase during operation thus increasing the chance of collisions to occur. However, when vessels enter the channel and abide to the speed limits the collision risk is low. The impact of increased number of vessels on collisions risk of marine mammals and marine turtles is expected to be **minor**.

Mitigation measures

- Speed limits should be adhered to whilst entering the port and general observations for marine mammals and marine turtles to avoid collisions.

Increased use of the area increasing the risk of pollution incidents

The increased use of the area by vessels and the increased storage capability for hydrocarbons potentially gives rise to an increased risk of spillage of hydrocarbons in the area. Spillages of hydrocarbons can have significant impacts on marine fauna and flora with the level of significance dependent on the type of hydrocarbon and the extent of the spill.

Mitigation measures

See Section 6.6.2 where measures associated with impact of pollution incidents are described.

6.10 Ecosystem Services

Impact of construction and operation activities on fish resources (provisioning ecosystem service)

The area off the coast of Nouakchott is used heavily for commercial fishing, which takes place from designated beach launches along the coast, indicating a strong presence of a provisioning ecosystem.

During construction, the dredging activities can potentially impact the fish resources in the area.

As the area that is impacted is small compared to the entire coastline and the impact will only be temporary, the impact on the fish resource is expected to be **negligible**

Impact of dredging activities on coastal protection (supporting ecosystem service)

The sand dune system to the north (and further south) offer protection from coastal inundation and are therefore supporting services.

The disposal of sediment near the shore line can contribute to coastal protection to the south of the port by adding sediment to the shoreline. The area to the south of the port is eroding because of the presence of the current port. Disposing spoil in disposal site A will most probably have little to no impact on the shoreline because the depth of the site is too deep.

The positive impact of the disposal of sediment in the disposal sites has a **negligible** impact on coastal protection.

6.11 Visual Amenities

6.11.1 Construction phase

Impact of project activities and components on landscape and visual environment

Construction activities will mainly be inside the port footprint and will have no impact on the present visual environment. The dredging and disposal activities are limited in time, transient and close to the port site. No sensitive receptors (e.g. residents, tourists) are present nearby to the port, and so the visual change during construction is assessed as **negligible**.

6.11.2 Operation phase

Impact of project activities and components on landscape and visual environment

Once construction is complete, the container terminal and associated facilities will be located within the existing footprint of the port. The cranes that are to be constructed will be prominent in the flat area surrounding Nouakchott and the port, but there are already several heavy lifting cranes, stacks, and electricity pylons in the immediate vicinity, and so the project infrastructure will not drastically change the existing industrial nature of the landscape, and therefore the visual impact of the Project is considered **negligible**.

6.12 Community Health, Safety and Security

6.12.1 Construction phase

Increased risk of road traffic safety incidents

All Project related traffic will utilise the existing main entrance to the site, accessed by two main roads as described in section 4.15.3 (roads). Outside of the port, wider community members use the roads (either in vehicles, motorbikes/bikes, donkey cart, pedestrian), and commercial activity takes place adjacent to the road several kilometres away from the port on the main access roads.

During the construction phase of the Project, large volumes of material (aggregate, sand, cement, etc.) will need to be hauled to the project site. Cement will be sourced from nearby cement plants, sand and aggregates from quarries further away. Adding to this the transportation of equipment and workers, the construction related activities will result in a significant incremental increase of traffic coming in and out of the site. The additional powerline to be installed next to the road will potentially impact or hinder existing road traffic at some points as well.

The potential impact of increased risks of traffic safety incidents is considered as **moderate**.

Mitigation Measures

- To reduce the risk of traffic accidents the EPC Contractor will develop and implement a **Traffic Management Plan** including design of access points, signage, speed limits, training and fitness of drivers, maintenance of vehicles, use of traffic marshals, procedures for transport of oversized loads, maintenance of a log for traffic related incidents, sensitisation of road users and people living or working close to the road and establish a monitoring mechanism to ensure effectiveness of the plan;
- Avoid night driving where possible and, where necessary, implement reduced speeds for night driving;
- Use as much as possible buses for the commuting of project workers; and
- Establish a grievance mechanism that allow communities to communicate concerns and have them addressed in a timely and effective manner.

The effective implementation of the mitigation and management measures proposed above will reduce the residual impact to **minor**.

Increased risk of vessel traffic safety incidents

As can be seen on Figure 4-19, dredging will partly take place outside the marine exclusion zone and the disposal sites are located largely outside the marine exclusion zone, and in grounds within which fishing is permitted. The potential impact of increased risks of traffic safety incidents is considered as **moderate**.

Mitigation Measures

- Clearly demarcate marine (e.g. markers and buoys with lights etc.) worksites;
- Equip vessels involved in dredging and other construction-related activities with navigation equipment and suitable aids (such as buoys and lights) to minimise interference with other vessels and to maintain high visibility at all times;
- Ensure that all service and construction vessels are equipped with a functioning radar and communication equipment, and that the radar system is continuously monitored;
- Maintain ongoing engagement with fishing groups (as well as other relevant stakeholders) and communicate specific project information such as exclusion zones well in advance of activities; and
- Notices should be issued to users of the marine environment to ensure awareness of the activities.

The effective implementation of the mitigation and management measures proposed above will reduce the residual impact to **minor**.

Impact on community health from construction activities

Community health issues are common on large construction projects, and those associated more commonly with port infrastructure include, amongst others, dust, noise, and vibration from construction activity, and communicable diseases associated with the influx of temporary expat construction workers. A small informal settlement is situated near the route of the underground powerline. The construction of the new underground power line (6 km) will have minor impacts on the residents associated with a temporary increase in noise and dust emissions. There will be no relocation associated with this work. The risk to community health and safety can be considered **minor**.

Mitigation Measures

- Implement the measures mentioned above (Section 6.6.1) to mitigate dust and exhaust emission; and
- Develop and implement a programme to raise awareness, with special attention to incoming expat workers, on HIV/AIDS (and other sexually transmitted diseases), which includes voluntary testing, provision of condoms, and education.

The effective implementation of the mitigation and management measures proposed above will reduce the residual impact to **minor**.

6.12.2 Operation phase

Increased risk of road traffic safety incidents

With the increased terminal throughput, the number of container trucks circulating on the main access roads is expected to increase significantly over the life time of the project. However, this will be done gradually and as a result the impact of increased risk of road traffic safety incidents is considered as **minor**.

Mitigation Measures

Recommended mitigation measures are similar to the mitigation and management recommendations during construction outlined above.

- Establish a grievance mechanism that allow communities to communicate concerns and have them addressed in a timely and effective manner; and
- Consider offering road safety training to main container trucking companies and applying an incentive scheme for companies that can demonstrate good maintenance of their vehicles and low accident statistics.

Increased risk of vessel traffic safety incidents

With the increased terminal throughput, the number of vessels circulating in the navigation access channel is expected to increase over the life time of the project. However, this will be done gradually and as a result the impact of increased risk of vessel traffic safety incidents is considered as **negligible**.

6.13 Economics and Livelihood

6.13.1 Construction phase

Impact on fishing grounds and fishing access

Since the access channel will be extended by 3.5 km fishing activity might be hampered by the dredging activities. When the vessel that is transporting construction goods for use by the Project is within the existing navigation routes to access the port, it is unlikely to have a significant impact in the overall risk to artisanal fishing boats. However, when the dredging works take place outside the current access channel and outside the marine security zone this could interfere with artisanal fishing boats who are trying to reach the fishing grounds to the south of the port.

Dredging partly takes place outside the exclusion zone and the disposal sites are located largely outside the exclusion zone, and in grounds within which fishing is permitted. The traversing of vessels depositing dredge material may therefore cause some disruption to fishing activity. In addition, the dredging and disposal activity will give rise to sediment plumes and therefore increase the turbidity in the area. The increase in turbidity in the area and the extent of the sediment plume will need to be assessed in a detailed sediment plume model. Some fish species may avoid the area with high turbidity or the plume can influence the feeding behaviour. However, the area that will be impacted is small compared to the entire coastline area which is available as habitat for commercial fish species and most fish species will be able to avoid the affected area. Also, the duration of the impact will be felt over a short duration (5 months including mob-demob) and will not be repeated frequently.

Thus, the impact on commercial fish species and fisheries is expected to be **minor**.

Mitigation Measures

- Implement the identified measures to mitigate the risk of increase vessel traffic incidents (section 6.12.1);
- Establish a grievance mechanism that allow fishermen to communicate concerns and have them addressed in a timely and effective manner.

Hindrance of port operations

As raised during the stakeholder engagement meetings, current port operators are concerned about hindrance of their activities during the construction phase of the project, in case dredging and other construction activities impede on their access by road or vessels.

Based on a review of the proposed construction activities and the fact that the new quay will be built from the land side, it is expected that the only activities that could hinder current port operators are: the destruction of the warehouses still in use in the area of the future container yard, and the dredging activities. Since the number of warehouses in use is limited and new areas have been allocated already in the northern part of the port for their relocation, the impact of their destruction is considered limited. Regarding dredging, considering the relatively limited vessel traffic at the port, it is expected that the dredger can rather easily adapt its work planning to hinder as little as possible the vessel movements, provided good coordination is in place. And dredging activities will be limited in time (about 5 months including mob-demob). Therefore, the impact is considered **minor**.

Mitigation Measures

Measures will be developed by the EPC Contractor and ARISE to reduce hindrance of construction activities on current port operations. These measures will include regular engagement and coordination meetings with the Port Authority and relevant port operators to inform them about construction schedule and activities and collect their feedback and potential grievances. In particular, the Port Authority will coordinate with ARISE and the Dredging Contractor to ensure that dredging activities hindrance to vessel movement is as low as possible. Residual impact is expected to be **minor**.

Employment opportunities

Construction activities are expected to require about 400-650 local workers, both skilled and unskilled job. Next to the direct employment opportunities, there are supply chain opportunities for (small-scale) local business and entrepreneurs and Mauritanian companies to supply items and services like food and beverage, small materials and transportation.

Enhancement Measures

- Develop and implement a **Local Employment and Content Plan** to maximise the employment of local labour and Mauritanian nationals. This plan should:
 - include provisions for equal opportunity (non-discrimination by gender, ethnicity, religion, and age) and for “equal pay for work of equal value”.
 - facilitate identification and selection of qualified local and Mauritanian companies to provide needed supplies and services.
 - include provisions for advance notice to local companies, along with selection criteria including health and safety, to allow them to prepare for upcoming opportunities
- Set-up a fair, inclusive and transparent recruitment process for the workforce needs and ensure that this is clearly communicated to all potential work force in advance of the construction phase, in order to manage expectations and opportunistic influx.
- Disseminate information about local employment and contracting opportunities equitably by using accessible communication channels such as local government bulletins, notice boards, registration with district employment departments, and advertisements in local newspapers;
- Set-up a local hiring office for use by all contractors to advertise positions, receive applications, and provide guidance to applicants.
- Develop and implement training programmes to develop local workforce and supplier capacity;

- Deliver to all project staff on-the-job training associated with their role, with associated certification for employees to use in future employment;
- Disclose Project employment and procurement information frequently and regularly through transparent communication on hiring policies amongst local communities, which aid in managing expectations and demonstrating to local communities that Arise is providing training and employment opportunities to their full ability.

6.13.2 Operation phase

Impact on fishing grounds and fishing access

During operations, there is possibly an impact on fishing activities because the access channel will be extended outside the maritime security zone (as shown on Figure 4-19). It is not clear what will happen to this security zone but there is a high possibility that it will be extended in line with ISPS Code. If this is the case, then this would mean that the artisanal fishing boats will need to travel further offshore to be able to reach the southern fishing grounds. Therefore, the impact on fishing grounds and access is **moderate**.

Mitigation Measures

- Discuss the status of the marine security zone with the Port Authority; discussions should be oriented towards not extending the security zone but instead installing buoys on each side of the access channel just out of the security zone to indicate to fishermen where to cross;
- Ensure that, where possible, safety exclusion zones are clearly demarcated, noted and/or monitored, to enable vessels to be aware when they are close to the safety zones.

Enhanced national economic growth

The construction and operation of the new container and hydrocarbons terminal will carry the economic growth of Mauritania and create opportunities for businesses and socio-economic development in the country. It will also allow to reduce the cost of living of Mauritians. These project benefits are described in Section 3.2.2 of the report.

The success of the new terminal relies on the capability of the Mauritanian Government to carry on with its economic policies and ensure the political stability of the country.

The impact is **positive**.

Employment opportunities

For the operation of the new container terminal, approximately 500 jobs (direct and indirect) are expected to be created. These jobs will be a mixture of both skilled and unskilled jobs, with the majority being from the national workforce.

As a consequence of the operation of the new container terminal, the other existing terminals' activity may be reduced due to new competition. However, the employment opportunities created by the project and the economic spin-off should compensate for this potential loss.

The overall impact in terms of employment opportunities is considered **positive**.

Enhancement Measures

To enhance the positive impact of employment opportunities, the same measures as the one described for the construction phase will be developed and implemented in the operation phase.

6.14 Cultural Heritage

6.14.1 Construction phase

Impact of influx of expat workers on cultural heritage

No cultural heritage site of significance were identified during the baseline survey. The mosque identified at the port entrance will likely experience negligible impact from activities. As up to 350 expat workers will be mobilised during construction, there is a risk of cultural misunderstandings between expat workers and national workers and other port workers.

The impact on cultural heritage is rated as **minor**.

Mitigation Measures

- Develop training and awareness material to educate Project staff and contractors in the identification and understanding of cultural sensitivities.

The residual impact on cultural heritage remains **minor**.

6.14.2 Operation phase

Impact of influx of expat workers on historic and cultural heritage

The operation phase will not have a significant impact on the historic and cultural heritage of the project area, and so the impact will likely be **negligible**.

6.15 Labour and Working Conditions

6.15.1 Construction phase

The construction phase of the Project will require significant labour force, expected to peak at 750 workers. The majority of the workers recruited locally and regionally will be unskilled and semi-skilled labourers. There will also be a substantial expatriate workforce mainly consisting of experienced or skilled staff, and management, of approximately 320 workers.

Potential issues related to labour related grievances, discrimination, equal opportunities, supply chain, risk of child labour and forced labour

In case of absence of policy and procedures regarding labour and working conditions, they can potentially be the cause of issues related to labour related grievances, workforce health and safety, discrimination, equal opportunities, supply chain, risk of child labour and forced labour. This would be considered as non-compliance with national and international labour standards (including the IFC PS2 requirements) and occupational health and safety requirements to worker welfare and safety and the impact is considered **moderate**.

Mitigation Measures

- Adopt and implement a **Human Resources Policy** and all relevant accompanying Procedures, Plans and manuals, in line with the applicable provisions in the Labour Act of Mauritania (Decree 2004-017) and the requirements of IFC Performance Standard 2;
- Develop a fair, inclusive and transparent recruitment process for the construction workforce, and ensure that this is clearly communicated to all potential workforce in advance of the construction phase, in order to manage expectations and opportunistic influx; no hiring of short-term labour to be made at the site gate;
- Prohibit forced labour and child labour – including verification procedures to check employees' age and safeguards that workers are not recruited so as to accrue unacceptable debt or limit access to essential documents;
- Recognise trade unions where workers request this in line with national legislation and international standards, no activity to discourage workers from forming unions, and policy towards other forms of collective organisation;
- Respect for any collective bargaining agreements;
- Adhere with the principles of non-discrimination at work;
- Provide reasonable terms and working conditions for employees including avoidance of excessive working hours, payment of at least the national minimum wage and seeking to provide a wage which will provide sufficient disposable income;
- Establish an effective worker's grievance mechanism, so that labour potential conflicts can be dealt with at an early stage and in a proper way; and
- Implement independent labour audits during the construction phase to check compliance of the Construction Contractors with the above measures.

These measures will facilitate protection of worker's rights and provision of a safe workplace, and limit impacts to a **minor** level.

Risk of health & safety incidents amongst labour force

Occupational health and safety issues during the construction period include, among others, exposure to dust and hazardous substances that may be present in construction materials and demolition waste (e.g. asbestos in the old warehouses, oil in old pipelines), hazardous substances in other facilities and equipment's (e.g. PCB and mercury in electrical equipment), and physical hazards associated with the use of heavy equipment and working at heights. With the high number of construction workers (750 at peak) with many of them not speaking the local language and the fact that most of the construction activities will take place within an existing port in operations, the risk of injury or fatality to project workers is rated as **major**.

Mitigation Measures

Occupational Health and Safety management and mitigation measures to be implemented by Arise (or by the EPC Contractor and sub-contractors) will include:

- Require that the Construction Contractors comply with Arise's OHS policy and develop and implement a project specific Occupational Health and Safety ('OHS') Plan and accompanying Procedures. All Contractors' plans shall be reviewed for adequacy prior to start of construction activities.
- Conduct daily worker induction including detailed H&S training, including awareness raising regarding disease vectors, for all staff and conduct daily H&S toolbox talks with the entire workforce prior to commencement of construction activities;

- Provide specific H&S training programmes for workers assigned to tasks associated with particular H&S risks i.e. working at heights, hot work, drivers, machine operators, those working in areas with elevated dust and noise levels. Provide first aid training for key staff and include issuing of first aid certificates;
- Ensure Personal Protective Equipment (PPE) is worn at all times during construction, where required. This will depend on the type of work being conducted but will include hard hats, safety boots, hearing protection, eye protection, and lifejackets or buoyancy aids;
- Make readily available first aid kits and defibrillators at several locations on site;
- Provide safe access arrangements suitable for the size and type of vessels calling at port facilities, such as guard rails and/or properly secured safety nets between ships and the adjacent quay;
- Provide dock premises with adequate and suitable rescue and lifesaving equipment and means to escape from danger, e.g. handholds on the quayside at water level, ladders on quay walls and life-saving appliances;
- Install warning signs in place, including those for the electrical and mechanical equipment safety warning, and chemical hazard warning;
- Provide appropriate road signs and markings and separate people from areas of vehicle traffic and make vehicle passageways one-way, to the extent practical;
- Vehicles should be safe, provided with suitable visibility aids, regularly maintained, repaired and inspected and all drivers should be fit and competent to operate all the vehicles they use at work;
- Develop and implement an **Emergency Preparedness and Response Plan**; and
- Provide HIV/AIDS awareness and prevention training which will include voluntary testing, the provision of condoms, and education of the workforce.

Strict implementation and ongoing monitoring of the effectiveness of the mitigation measures will reduce the residual impact for any OHS related impacts during construction to **minor**.

6.15.2 Operation phase

Impact on labour conditions from operation phase

Same as in construction phase.

Mitigation Measures

Same as in construction phase.

Impact on occupational health and safety during routine operation activities

Occupational health and safety issues relevant to the port operations include:

- physical hazards associated with cargo handling (e.g. work at height with the cranes) and the use of related equipment, machinery, and vehicles;
- chemical hazards, associated with working with fuels spills (e.g. unloading of oil tankers at the hydrocarbon berth and during fuelling/bunkering activities) with the risk of exposure to VOC via inhalation or skin contact during normal use and the risk of fire and explosion;
- confined spaces (e.g. ship cargo holds, sewage tanks, etc.); and
- exposure to noise and dust.

The risk of injury or fatality to project workers during the operation phase is considered **moderate**.

Mitigation Measures

The same measures as the one mentioned above for the construction phase will be update for the operation phase activities and implemented. The implementation and adherence of these mitigation measures will reduce the residual impact to **minor**.

Impact on occupational health and safety from fire and explosion accident on hydrocarbon berth and pipelines

Accidental release of oil or gas either in pipelines or during unloading operations of oil tankers could result in fire or explosion in case of contact with an ignition source. Though the probably is low, the significance of such an impact on the health and safety of both project and port workers is high, and a result this impact is considered **moderate**.

Mitigation Measures

- Conduct a quantitative risk assessment (QRA) for the fuel unloading activities and section of pipeline crossing the container terminal;
- Install a combination of automatic and manual fire alarm systems that can be heard across the project site;
- Install active fire protection systems strategically located to enable rapid and effective response. The fire suppression equipment should meet internationally recognized technical specifications for the type and amount of flammable and combustible materials at the site;
- Implement safety procedures for unloading of product to transport systems (e.g. ship tankers), including use of failsafe control valves and emergency shutdown equipment;
- Prepare, as part of the Emergency Preparedness and Response Plan, a fire response plan supported by the necessary resources to implement the plan; coordinate with Port Authority firefighting team (if any) and with the fire brigades of Nouakchott; and
- Provision of fire safety training and response as part of workforce health and safety induction / training, including training in the use fire suppression equipment and evacuation, with advanced fire safety training provided to a designated firefighting team.

6.16 Cumulative Impacts

Impacts directly associated with the Project are discussed in the previous sections. In this section, the potential impacts associated with the cumulative effects of the Project and other developments in the area are described.

Cumulative impacts occur when a Project activity acts together with other activities (other projects or third-party activities) to impact on the same environmental or social resource or receptor. The IFC defines cumulative impacts as *“impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted”*.

Cumulative effects are difficult to predict as they are the result of complex interactions between multiple projects or activities. This difficulty is compounded by the fact that details of the future development are largely unknown at this stage. Moreover, whether or not a potential future development actually occurs is dependent on a number of factors that are unknown at the time of this assessment. Consequently,

cumulative impacts are qualitatively assessed herein, i.e. high-level descriptions of the potential impact are provided.

Mitigation and management of cumulative impacts often require cooperation with other stakeholders or at a government level and are frequently beyond the ability of a single project development to control solely. In line with international good practice, mitigation should be commensurate with the level of contribution to the cumulative impact by the developer.

Past and present activities were considered in developing the environmental and social baseline against which the Project is assessed, thus, such previous activities have already been considered in this ESIA and used as the baseline to assess the potential impacts of the proposed Project activities. Beyond the past and present activities, the following have been identified as 'reasonably defined' activities that could act together with the Project to cumulatively affect the environment:

- Improvement of main access road to and from the port; and
- Improvement of laydown yard of APM Terminals.

The cumulative impacts identified below have been assessed against only Air Quality, Visual and Noise, Community Health and Safety, and Livelihoods and Businesses. No other receptors identified in the above sections are considered to be impacted by the known plan developments as discussed below.

6.16.1 Cumulative impacts of improved road access

As mentioned in section 4.15.3, the government is currently planning to upgrade the coastal road to and from the port, widening the road from single-carriageway to dual-carriageway.

Air quality (through exhaust emissions and dust)

If expanded to dual-carriageway, then the road network will be able to cope with the higher volume of traffic, allowing vehicles to drive at a more efficient rate of fuel consumption. However, with larger cargos being handled within in the port, it is also likely that higher traffic volumes could account for higher emissions. Therefore, the cumulative impact on air quality is **minor**.

Visual and noise

Construction of a wider road network will not substantially change the visual impact of the area. Furthermore, as there are no receptors adjacent to the widened road the potential impact on visual and noise is **minor**.

Community health and safety

No communities are situated along the road (once resettlement of the informal community takes place), and so community health and safety as a result of the widened road is considered **minor**.

Economics and livelihood

The construction will lead to additional temporary and permanent job creation, of varying skill levels. It will allow greater traffic levels and therefore improved access for supply and delivery of goods. This therefore will be a **positive** impact.

6.16.2 Cumulative impacts of improved APM Terminal laydown yard

Another port operator, APM Terminals, is separately planning on improving their laydown yard, by manufacturing interlocking bricks and paving the yard with these bricks. It is thought that this will start in the first 6 months of 2019.

Air quality (through exhaust emissions and dust)

Methods of production and construction are not known, but it is likely that this will be low impact with regards to air emissions, as well as only a short-term project. Therefore, the cumulative impact on air quality is **minor**.

Visual and noise

The project will take place on an existing laydown site, and so visually will not have an impact. The noise levels used are unlikely to be above the ambient operating noise of the port, and so the cumulative impact for this project is **minor**.

Community health and safety

No communities are situated within the port facility, and so community health and safety as a result of this project is considered **negligible**.

Economics and livelihood

The construction will lead to additional temporary and permanent job creation, of varying skill levels. It will allow improved access for supply and delivery of goods within the laydown yard. This therefore will be a **positive** impact.

7 Environmental and Social Management Plan

7.1 Introduction

This chapter provides the ESMP for the NCT Project. Elements of this ESMP will be taken forward and incorporated into a comprehensive project Environmental and Social Management System ('ESMS') that will be used to deliver the Project's EHS regulatory compliance objectives and other related commitments.

This ESMP is a delivery mechanism for environmental and social mitigation and enhancement measures made in the ESIA Report (as described in Chapter 6 of this ESIA). The purpose of the ESMP is to help translating these recommendations into practical management actions which can be adequately resourced and integrated into the Project phases. The ESMP is, therefore, a management tool used to ensure that undue or reasonably avoidable adverse impacts of construction and operation are prevented or reduced and that the positive benefits of the Project are enhanced.

7.1.1 Overview and Scope

The ESMP has been developed to meet international standards on environmental and social management performance, specifically those set out by the IFC.

The ESMP is intended to cover those activities described in Chapter 3 of this ESIA report. It covers project activities during construction and operation and will be subject to thorough reviews prior to the commencement of activities to ensure completeness. The ESMP does not include measures for activities related to equipment and facility fabrication being done offsite. It should be noted that this provides the outline requirements for environmental management. Provision will be made for updating the outline ESMP once the detailed project design is complete and for adapting the ESMP to relevant project stages as part of the overall ESMS.

The plan details the mitigation and enhancement measures Arise has committed to implement through the life of the Project and includes desired outcomes; performance indicators; targets or acceptance criteria; monitoring and timing for actions and responsibilities. Arise will have principal responsibility for all measures outlined in the ESMP and may delegate responsibility to its contractors, where appropriate. In cases where other individuals or organisations have responsibility for mitigation or enhancement measures, this is clearly indicated within the ESMP matrix provided in [Appendix 7](#).

7.1.2 Objectives

The ESMP is essential for successfully implementing the Project's social and environmental performance throughout the life of the Project. Having this framework in place ensures a systematic approach to bringing environmental and social considerations into decision making and day-to-day operations. It establishes a framework for tracking, evaluating and communicating environmental and social performance and helps ensure that environmental and social risks and liabilities are identified, minimised and managed. The ESMP will be a living document, and will continue to develop during the design and construction phase to enable continuous improvement of the Project's social and environmental performance.

In particular, the objectives of the ESMP are to:

- Promote environmental and social management and communicate the aims and goals of the ESMP;

- Ensure that all workers, subcontractors and others involved in the Project meet legal and other requirements with regard to environmental and social management;
- Incorporate environmental and social management into project design and operating procedures;
- Address concerns and issues raised in the ESIA’s stakeholder consultation process and those that will likely continue to arise during the Project’s lifetime;
- Serve as an action plan for environmental and social management for the Project;
- Provide a framework for implementing project environmental and social commitments (i.e., mitigation measures identified in the ESIA); and
- Prepare and maintain records of project environmental and social performance (i.e., monitoring, audits and non-compliance tracking).

7.2 Organisation

7.2.1 Roles and Responsibilities

7.2.1.1 Arise

Arise is committed to provide resources essential to the implementation and control of the ESMP in the construction and the operation of the Project. An organisation chart of Arise is provided in Figure 7-1 below.

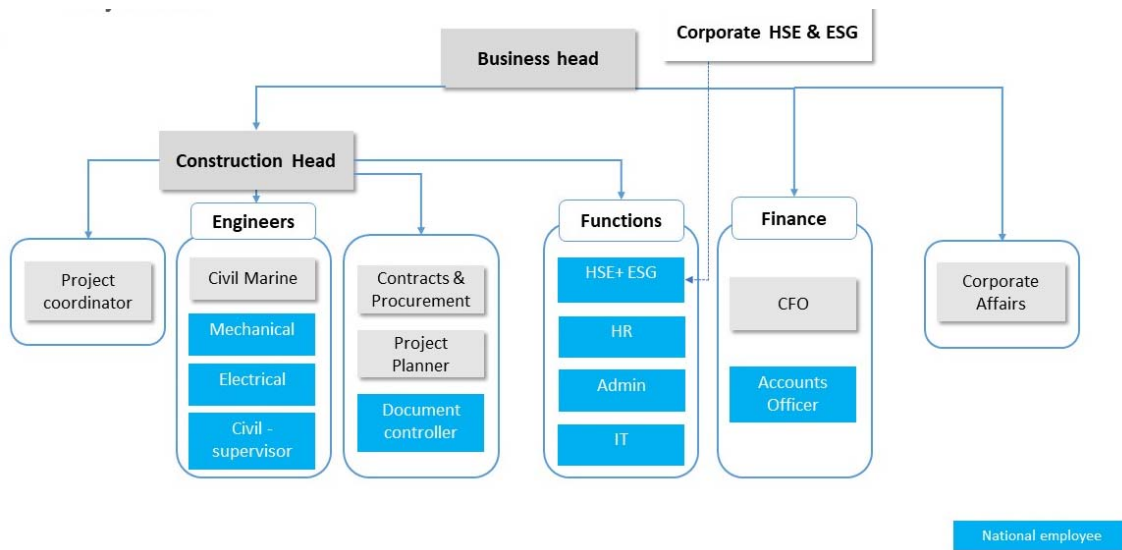


Figure 7-1: Arise Organisation Chart

Resources include the appropriate human resources and specialised skills. Arise will have dedicated personnel competent on the basis of appropriate education, training, and experience that will manage and oversee the EHS aspects of Project construction and operation, see Table 7-1.

Table 7-1: Roles and Responsibilities

Position	Responsibility
Project Head	Oversee and coordinate all activities pertaining to the Project; ultimately responsible for EHS. Ensure delivery by the Project of its EHS and operational targets. Ensure effective communication with all stakeholders.
Construction Manager	Technical aspects of the Project including Contractors supervision during construction.
Operations Manager	Technical aspects of the Project including Contractors supervision during operations.

EHS Manager	<p>Ensuring that the Project and subcontractors operate in accordance with the applicable regulatory environment, health and safety requirements and plans.</p> <p>Monitor implementation of environmental and social protection measures, and assist with technical input into spill response requirements.</p>
Community Liaison Officer (CLO)	<p>Liaise with local communities and government regulators on the Project's behalf.</p> <p>Implement EHS awareness and education programmes with communities.</p>

7.2.1.2 Contractors

Prior to assigning any contract, Arise will pre-qualify each contractor according to commercial, technical, quality assurance and its past performance on EHS standards so as to satisfy Arise's requirements and policies. Each contractor will assign an HSE Manager whose responsibility is to ensure that environment, health and safety regulatory requirements are met and that ESMP requirements are properly implemented. The main contractors (e.g. EPC Contractor) will be required to develop and submit to Arise its corresponding ESMP in accordance to the IFC PS requirements.

7.2.1.3 Regulatory Agencies

Regulatory agencies (Direction du Contrôle Environnemental (DCE) in Mauritania) are empowered by law to take responsibility for the monitoring of the operations of all organizations operating within the boundaries of the country to ensure environmental and socio-economic sustainability of the potentially affected communities.

7.2.1.4 Port Authority

Arise Mauritania has signed a concession agreement with the Republic of Mauritania for the construction and operation of the new container terminal facility.

As such Arise has agreed to ensure implementation and respect of the international standards to which the Port of Nouakchott is following. The standards include the ISPS requirements, the emergency response plan (national and at port level) and, since Arise will have their own facility, waste water treatment effluents standards (as required by MARPOL 73/78).

To ensure respect of the agreement's clauses, the Ministry of Equipment and Transport, through the Port Authority, may conduct audits of the new container terminal with regards to security aspects, implementation of the internal emergency response plan and its linkage to the national and port plans, as well as require reception of the waste water facility effluent analysis results.

7.2.2 Training and Awareness

Arise will identify, plan, monitor, and record training needs for personnel whose work may have a significant adverse impact upon the environment or social conditions. Arise recognises that it is important that employees at each relevant function and level are aware of the Project's environmental and social policy; potential impacts of their activities; and roles and responsibilities in achieving conformance with the policy and procedures.

This will be achieved through a formal training process. Employee training will include awareness and competency with respect to:

- Environmental and social impacts that could potentially arise from their activities (including dust, noise, and soil/water contamination);
- Necessity of conforming to the requirements of the ESIA and ESMP, in order to avoid or reduce those impacts; and
- Roles and responsibilities to achieve that conformity, including those in respect of change management and emergency response.

The EHS Manager is responsible for coordinating training, maintaining employee-training records, and ensuring that these are monitored and reviewed on a regular basis. The EHS Manager will also periodically verify that staff is performing competently through discussion and observation.

Employees responsible for performing site inspections will receive training by drawing on external resources as necessary. Training will be coordinated by the EHS Manager prior to commissioning of the facilities. Upon completion of training and once deemed competent by management, staff will be ready to train other people.

Similarly, Arise will require that each of its contractors' institute training programmes, as appropriate, for its personnel. Each contractor is responsible for site EHS awareness training for personnel working on the job sites. The contractors are also responsible for identification of any additional training requirements to maintain required competency levels.

The contractors training programs will be subject to approval by Arise and it will be subject to checks to verify that:

- Training programs are adequate;
- All personnel requiring training have been trained; and
- Competency is being verified.

7.2.3 Communication and Stakeholder Engagement

Arise will implement the stakeholder engagement program and the grievance mechanism developed for the Project, as provided in the SEP (see **Appendix 6**).

7.2.4 Documentation

Arise will control E&S documentation, including management plans and associated procedures, checklists, forms and reports, through a formal procedure. All records will be kept on site and will be securely backed up in accordance with good IT-practice. Records will be kept in both hard copy and soft copy formats. All records will be archived for the life of the project.

The EHS Manager is responsible for maintaining a master list of applicable E&S documents and making sure that this list is communicated to the appropriate parties. The E&S Manager is responsible for providing notice to the affected parties of changes or revisions to documents, for issuing revised copies and for checking that the information is communicated within that party's organisation appropriately.

Each contractor will be required to develop a system for maintaining and controlling its own E&S documentation and describe these systems in their respective E&S plans.

7.2.5 Managing Changes

Changes in the Project may occur due to unanticipated situations. Adaptive changes may also occur during the course of final design, commissioning or even operations. The Project will implement a formal procedure to manage changes in the Project that will apply to all project activities.

The objective of the procedure is to ensure that the impact of changes on the worker's labour and working conditions, the environment and the communities' socio-economic conditions are identified and assessed prior to changes being implemented.

The management of change procedure will ensure that:

- Proposed changes have a sound technical, safety, environmental, and commercial justification;
- Changes are reviewed by competent personnel and the impact of changes is reflected in documentation, including operating procedures and drawings;
- Hazards resulting from changes that alter the conditions assessed in the ESIA will be identified and assessed and the impact(s) of changes do not adversely affect the management of health, safety or the environment;
- Changes are communicated to personnel who are provided with the necessary skills, via training, to effectively implement changes; and
- The appropriate Arise person accepts the responsibility for the change.

As information regarding the uncertainties becomes available, the Project ESMP will be updated to include that information in subsequent revisions. Environmental and social, as well as engineering feasibility and cost considerations will be taken into account when choosing between possible alternatives.

7.2.6 Operational Control Procedures

Where possible, each potentially significant impact identified in the ESIA will have an operational control associated with it that specifies appropriate procedures, work instructions, best management practices, roles, responsibilities, authorities, monitoring, measurement and record keeping for avoiding or reducing impacts. Operational controls are monitored for compliance and effectiveness on a regular basis through a monitoring and internal auditing procedure described in the ESMP.

Operational control procedures will be reviewed and, where appropriate, amended to include instructions for planning and minimising impacts, or to at least reference relevant documents that address impact avoidance and mitigation.

7.2.7 Emergency Preparedness and Response Plan

Arise will prepare plans and procedures to identify the potential for, and response to, environmental accidents and health and safety emergency situations and for preventing and mitigating potentially adverse environmental and social impacts that may be associated with them.

Emergency preparedness and response will be reviewed by Arise on at least an annual basis and after the occurrence of any accidents or emergency situations to ensure that lessons learnt inform continuous improvement.

Emergency exercises will be undertaken on a regular basis to confirm adequacy of response strategies. Investigations of accidents or incidents will follow formal documented procedures.

7.3 Checking and Corrective Actions

Checking includes inspections and monitoring as well as internal audit activities to confirm proper implementation of checking systems as well as effectiveness of mitigations. Corrective actions include response to out-of-control situations, non-compliances, and non-conformances. Actions also include those intended to improve performance.

7.3.1 Monitoring

Monitoring will be conducted to check compliance with regulatory requirements as well as to evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. Monitoring parameters, frequency and sampling points are included in the ESMP matrix provided in **Appendix 7**.

7.3.2 Auditing

Beyond the routine inspection and monitoring activities conducted, audits will be carried out internally by Arise to verify compliance with regulatory requirements as well as their own EHS standards and policies. Audits to be conducted will also cover the contractor self-reported monitoring and inspection activities. The audit shall be performed by qualified staff and the results shall be reported to Arise to be addressed.

The audit will include a review of compliance with the requirements of the ESIA and ESMP and include, at a minimum, the following:

- Completeness of EHS documentation, including planning documents and inspection records;
- Conformance with monitoring requirements;
- Efficacy of activities to address any non-conformance with monitoring requirements; and
- Training activities and record keeping.

There will be a cycle of audits into specific areas of the Project. The frequency of audits will be risk based and will vary with the stage of the Project and will depend on the results of previous audits.

7.3.3 Corrective Action

Investigating a 'near-miss' or actual incident after it occurs can be used to obtain valuable lessons and information that can be used to prevent similar or more serious occurrences in the future.

Arise will implement a formal non-compliance and corrective action tracking procedure for investigating the causes of, and identifying corrective actions to, accidents or environmental or social non-compliances. This will ensure coordinated action between Arise and its contractors. The EHS Manager will be responsible for keeping records of corrective actions and for overseeing the modification of environmental or social protection procedures and/or training programs to avoid repetition of non-conformances and non-compliances.

7.3.4 Reporting

Throughout the Project, Arise will keep the regulatory authorities informed of the Project performance with respect to E&S matters by way of written status reports and face-to-face meetings.

If required, Arise will provide appropriate documentation of E&S related activities, including internal inspection records, training records, and reports to the relevant authorities. Contractors are also required to provide E&S performance reporting to Arise on a regular basis. These will be used as inputs to the above.

7.4 Environmental and Social Management

The environmental and social mitigation and enhancement measures and the monitoring and management responsibility for impacts during both construction and operation of the Project are given the ESMP Matrix provided in **Appendix 7**. These measures will be adopted by Arise and imposed as conditions of contract on the contractors hired for the Project.

Additional detailed policies and plans will need to be developed to support the implementation of this ESMP and as part of the development of the Arise ESMS.

A full list of the key management plans and strategic E&S documents identified in the ESIA for this Project is provided below:

- Environmental Monitoring Program
- Occupational Health and Safety Management Plan;
- Dredging Management Plan (DMP);
- Erosion and Sediment Control Plan
- Air emissions Management Plan
- Noise and Vibration Management Plan
- Ecological Management Plan
- Workers accommodations Management Plan
- Workers Grievance Mechanism
- Waste Management Plan;
- Spill Prevention and Response Plan
- Hazardous Materials Management Plan
- Raw Materials Management Plan
- Port Facility Security Plan
- Traffic Management Plan (see for more details Section 6.12.1 on mitigation measures to reduce the risk of road traffic safety incidents);
- Emergency Preparedness and Response Plan;
- Stakeholder Engagement Plan (already developed, see Appendix 6); and
- Community Impact Management Plan
- Community Health Management Plan (including health issues such as transmission of communicable diseases)
- Local Employment and Content Plan (see for more details Section 6.13 on enhancement measures for the impact on employment opportunities).
- Influx of Workers Management Plan

Some of these plans will only be required during the construction phase.

The timing of the development of the plans will be staged – construction related plans will be finalized and in place prior to the start of construction (except for the DMP, which will only need to be finalised and in place prior to the start of the dredging activities) and the operations related plans will be finalized and in place prior to the start of operations. They will be finalised by Arise, where appropriate in consultation with the DCE and other key stakeholders.

The E&S performance of the construction work undertaken by the EPC Contractor and the Dredging Contractor will be framed by the E&S obligations set-out in the General and Particular Conditions of the Contract agreement between the Arise and these contractors. The obligations will be integrated into a document titled “Environmental and Social Specifications for the Construction Phase” developed based on the IFC PS requirements. The specifications will set out the measures that the EPC Contractor will have to



take to comply with the recommendations and measures identified in the ESIA - and which will be set out in the form of various management plans prepared by the EPC Contractor.

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